For People Interested in the Enrichment of Personal Computing

December, 1982
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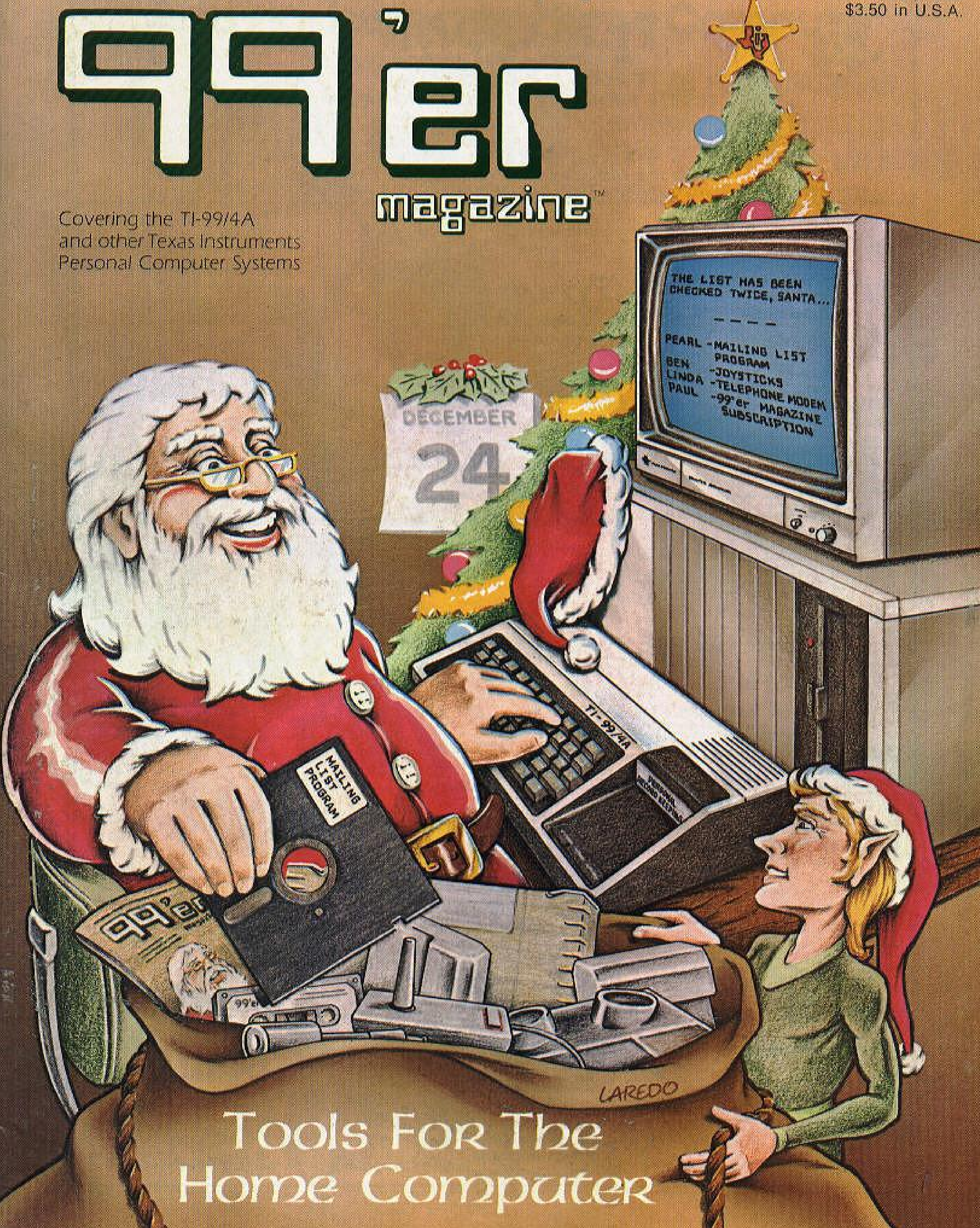
and other Texas Instruments
Personal Computer Systems


THE LIST HAS BEEN
CHECKED TWICE, SANTA...
- - - -
PEARL -MAILING LIST
PROGRAM
BEN -JOYSTICKS
LINDA -TELEPHONE MODEM
PAUL -99'er MAGAZINE
SUBSCRIPTION
DECEMBER
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TI-99/4A
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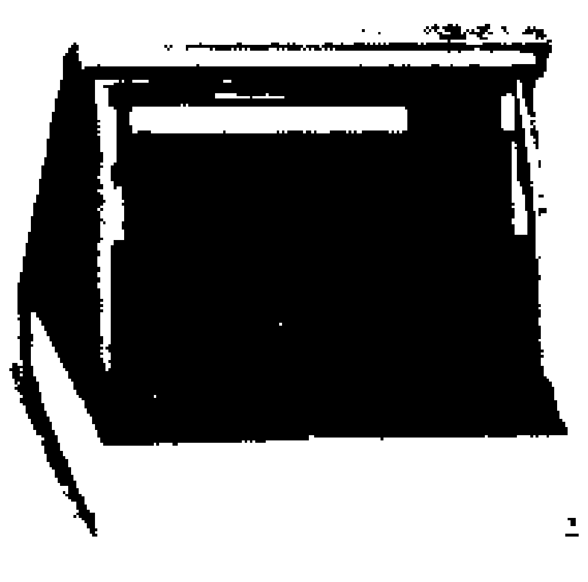

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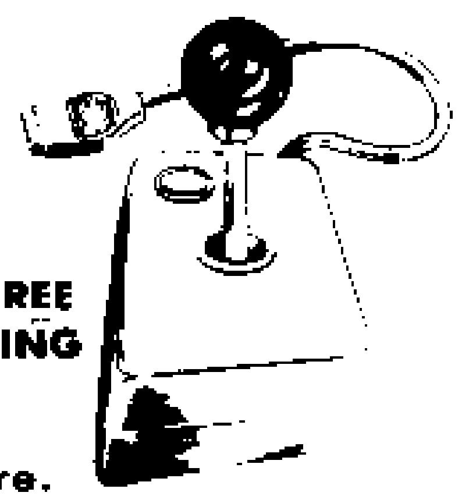

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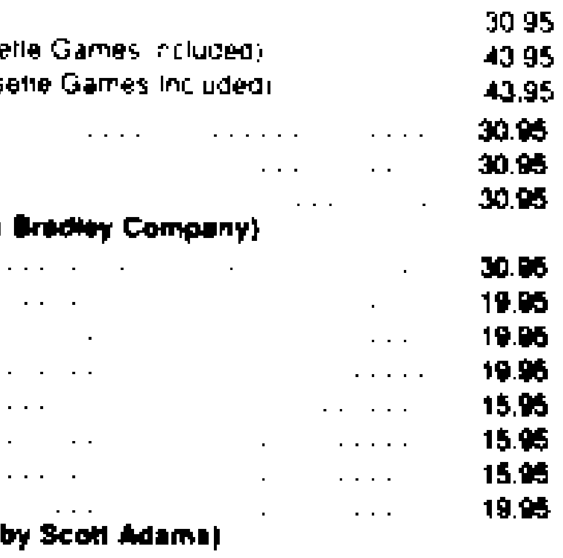

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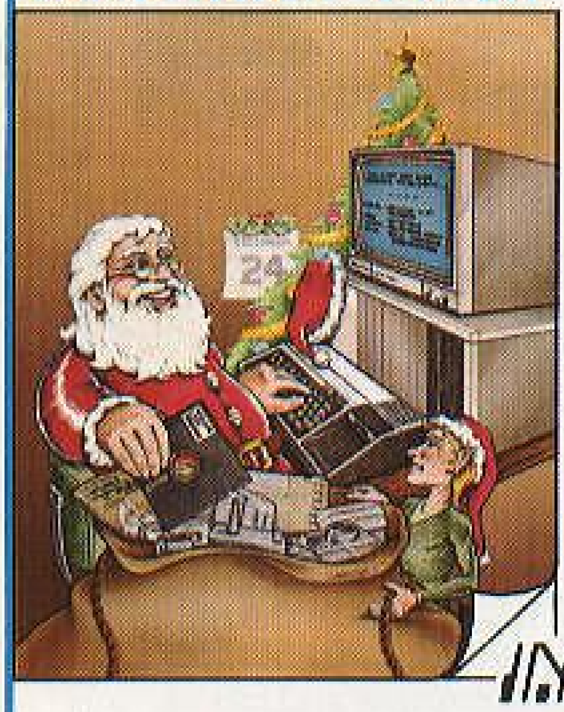


This Issue's Cover

Our talented staff artist, Laredo, has transported a familiar Christmas scene into the computer age. No wonder Santa Claus is using a Home Computer to run his ever-expanding workshop—he just ***had*** *to have one of his own after seeing it on so many of the lists he receives from good little boys and girls (of all ages). Santa well knows that good tools make life easier. Already his Home Computer has bailed him out more often than all the elves and reindeer—even Rudolph—combined. In fact, his latest software tools have streamlined the Christmas delivery operation so well, that perhaps more people will start believing Santa really* ***does*** *all that work in just one night. . .*

INSIDE 99'ER

Adaptation to sophisticated tools distinguishes humans from other life forms on the good ship Earth. The creation of tools by the few for use by the many continually expands the horizons of our society. The advent of the TI Home Computer and its ensuing proliferation have set the stage for a new class of powerful tools for common use—computer programs.

Once confined to scientific laboratories and huge corporate centers, utilitarian computer progams are now finding a place in many homes. Whether for word processing or home finances, these software tools are proving themselves invaluable.

TI-Fest: The Home Computer Show was the springboard for some new programs in this category. To see what else happened at this historic event, browse through our four-page photo tour of the show. By the way, we have an additional photo spread for you—one that illustrates with holiday spirit just how Texas Instruments produces the Home Computer. So be sure to also check our timely *Santa's Workshop* . . .

With photographic visions now dancing in your head, let's turn to the text—a text editor, that is. *Tex-Scribe: A Text Editor for the Home Computer* offers you a powerful writing tool. Once you have tried a text editor, you may decide to write a book or at least an epic poem.

You say that you need an idea for a poem? For a seasonal sample, read *A Christmas Computer Carol*. Even Santa got a chuckle out of it! Speaking of Christmas verses, did you get your greeting cards mailed out without trouble? Next year, you may find a mailing list program to be a useful tool for this purpose. We've reviewed one for you in *Managing A Mailing List the Futura Way*.

Wouldn't it be fun to design your own customized Christmas cards using the graphics of the Home Computer? *Plotting with the Home Computer* gives you dot-plot capability from TI BASIC using the TI Mini-Memory cartridge! And if your program for graphics design gets too complex, you might just wind up exclaiming, *Oh No! Memory Full!* For some practical tips on what to do in this case, read Regena's "memorable" article.

After working hard all day using your new tools, it is time to unwind with some Computer Gaming. The younger family members will enjoy piloting their own TI BASIC *Termite* through his wooden log. But watch out for knotholes!

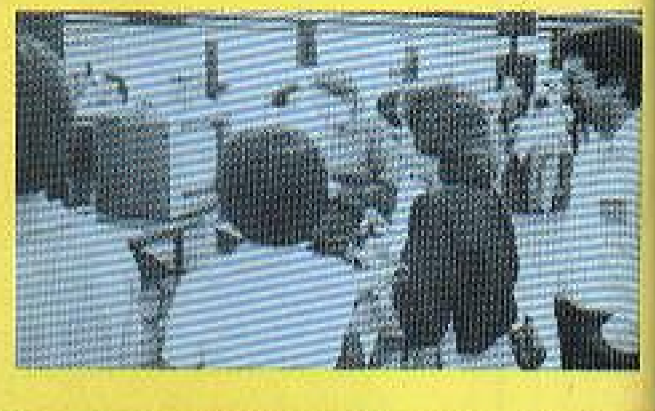
To extend your basic gaming enjoyment, be sure to stake your claim in the 99'er *Gold Rush*—an Extended BASIC graphic-arcade-adventure game for the whole family. Catch the fever, but keep your powder dry . . .

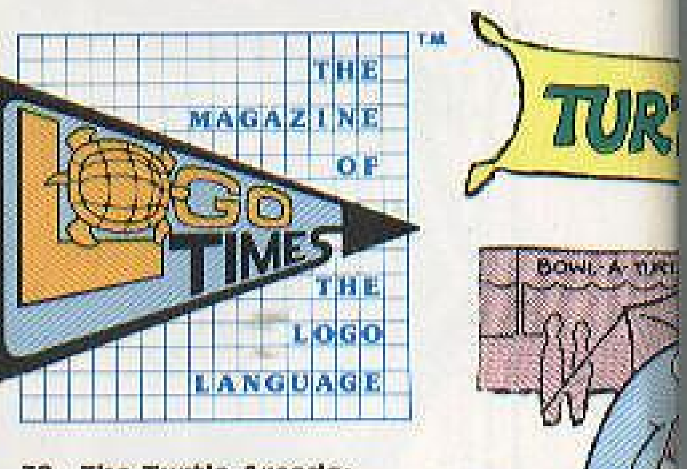
The biggest hit in Computer Gaming Land at TI-Fest was the new *Parsec* video arcade game from TI. It has everything including a talking, onboard-computer! Read the review of this exciting game—it's going to blast you right out of your space boots!

Playing all these computer games may cause you to attempt programming one yourself. If LOGO is your language choice for this project, *The Turtle Arcade: Movies & Video Games in LOGO* will be right up your alley . . .

All the elves and other lively spirits here at 99'er Magazine would now like to wish you a joyous and prosperous Holiday Season. And may all your programs RUN bug-free . . .

99'er Magazine SPECIAL FEATURES





32. The Turtle Arcade: Movies & Video Games in LOGO —By Henry Gorman

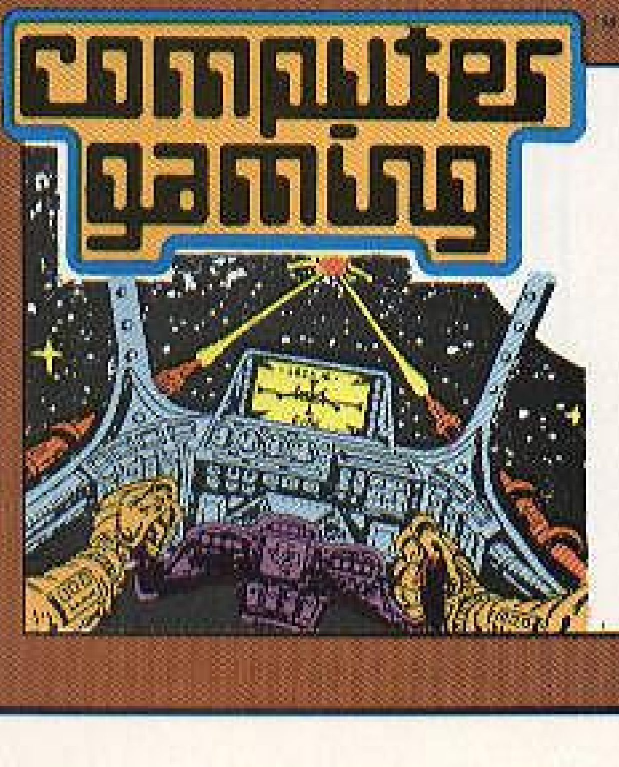
Programming Conventions

KEY-IN REFERENCE

ABCDEFGHIJKLMNOPQRSTUVWXYZabcd
efghijklmnopqrstuvwxyz0123456789
[illegible]

=Program as listed will completely fill available memory of TI-99/4A and cannot be RUN with disk controller (and possible RS232 interface) turned on. It must be SAVEd and RUN from cassette. It may also possibly be SAVEd and RUN from disk in Extended BASIC with the 32K memory peripheral if the last 2 character sets were not used.

=End of Program or Article



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Vol.2,No.2

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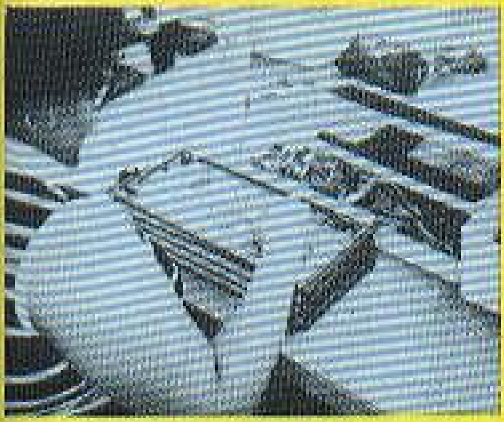

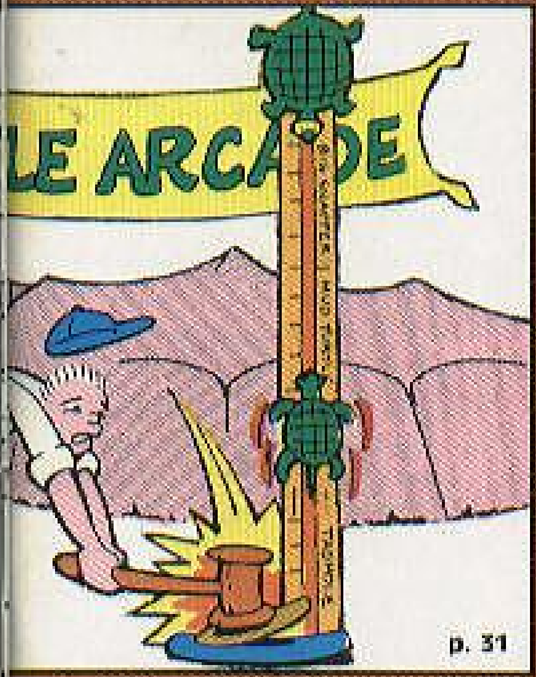

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99'ER VERSION

2 . 2 . 1 . XB AL MM EM

volume no.
issue no.
version
1 = original program
2 … n = no. of update
TI Extended BASIC
Assembly Language
Mini-Memory Required
32K Expansion Memory Required

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—*By David G. Brader*

11. Managing a Mailing List the Futura Way: A Review
—*By Maurice E. T. Swinnen*

14. A Christmas Computer Carol
—*By Steve Davis*

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19. Plotting With the Home Computer
—*By Joseph G. DeVincentis, Jr.*

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—*By Regena*

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- Termite—*By James R. Dew*
- Gold Rush—*By William K. Balthrop*

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—*By C. Q. Umber*

99'er magazine™

A Resource for People Interested in the Enrichment of Personal Computing

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Managing Editor
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Technical Editors
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Program Editor
G.R. Michaels

Office Manager
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Circulation & Fullfillment
Benjamin Kaplan
Coleen Nelson
Carol O'Brien
Eugene Springfield

Advertising
Linda Brundige
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Clerical
Betty Gregory
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ON SCREEN

"What's a nice little computer magazine like you doing in a place like this?"

Show business—you'd think it would be the farthest thing from the regimented life of publishing a monthly computer magazine, right? Well, I *used to* think so—that is, until this very same magazine put on the greasepaint, encouraged the crowd to roar, and produced the very first Home Computer Show.

The October, San Francisco event is now history. In this issue, we've reproduced a collection of photographs taken during the show that (we hope) conveys the exciting mood of the occasion. My staff and I were thrilled to have had the opportunity to meet many of our readers worldwide who attended the event, and now are eager to share the experience of 99'er TI-Fest with the rest of you.

The idea behind TI-Fest was to produce a computer-awareness show directed at and structured for a diverse group of people with little or no computer experience. The scores of computer shows that have preceeded TI-Fest have either been geared to hobbyists, businessmen, or members of the computer industry itself. And like the TI Home Computer that spawned it, a show of this type had been regarded as a concept a little too early for its time . . .

Well, the pundits were proved wrong again. Judging from the crowds that turned out, and the enthusiastic comments of happy showgoers and exhibitors alike, the event was a huge success. It seems to indeed be possible to produce a large computer show that *all* family members can enjoy and learn from—a show geared to the type of people who are now turning out by the hundreds of thousands to buy inexpensive, versatile computers for entertainment, education, home management, computer literacy, as well as small business and professional use.

We at 99'er Magazine are extremely proud to have played a part in the creation of an institution that promises to proliferate across the country and usher in a new age of computer awareness and use. We're also very proud to have had the support and the opportunity to work with a company like Texas Instruments who had the faith to stand by us and make the event happen.

As publisher of this magazine and producer of the show, there are many people I personally am indebted to. First, there are the members of my hard-working staff who pushed themselves beyond what we previously thought were the limits of human endurance in preparing for, transporting, setting up, running, and tearing down the show. And all this while I saddled them with the burden of conversion to a monthly publication schedule!

Then there were the individual TIers themselves: first the management people like Bill Turner, Gary Rado, and Don Bynum who committed the necessary TI resources that made the show possible. Special thanks are due to Don Bynum, manager of the Personal Computer Division, for taking the time out of his busy schedule to fly out to the show and engage Home Computer users in a lively Q & A forum. We'll have excerpts of the session in a forthcoming issue.

Of course, Don wasn't the only one who made the trip out from Lubbock and Dallas—many technical support personnel from Consumer Products Group and Corporate Engineering Center helped us hook up equipment, present seminars, and answer technical questions. The tutorial seminars presented by TIers on computer languages, word processing, and interactive video were especially well received; for that I have people like Jim Dugan, John Acker, Alan Acree, John Di Angelo, and Leon Tietz to thank.

Then there are all the other non-TIer seminar speakers to thank—familiar 99'er authors, advertisers, and others who presented a wealth of stimulating, informative material. Much of this material has already suggested ideas for new articles and features for publication in forthcoming issues of this magazine. I'm especially grateful to Hank Gorman, Roger Kirchner, George Gerhold, Charles Ehninger, Norma Clulow, Sam Jenkins and John Barnett for traveling the collective

By Gary M. Kaplan
Publisher & Editor-in-Chief

thousands of miles to attend the show and prepare their excellent seminars and workshop materials.

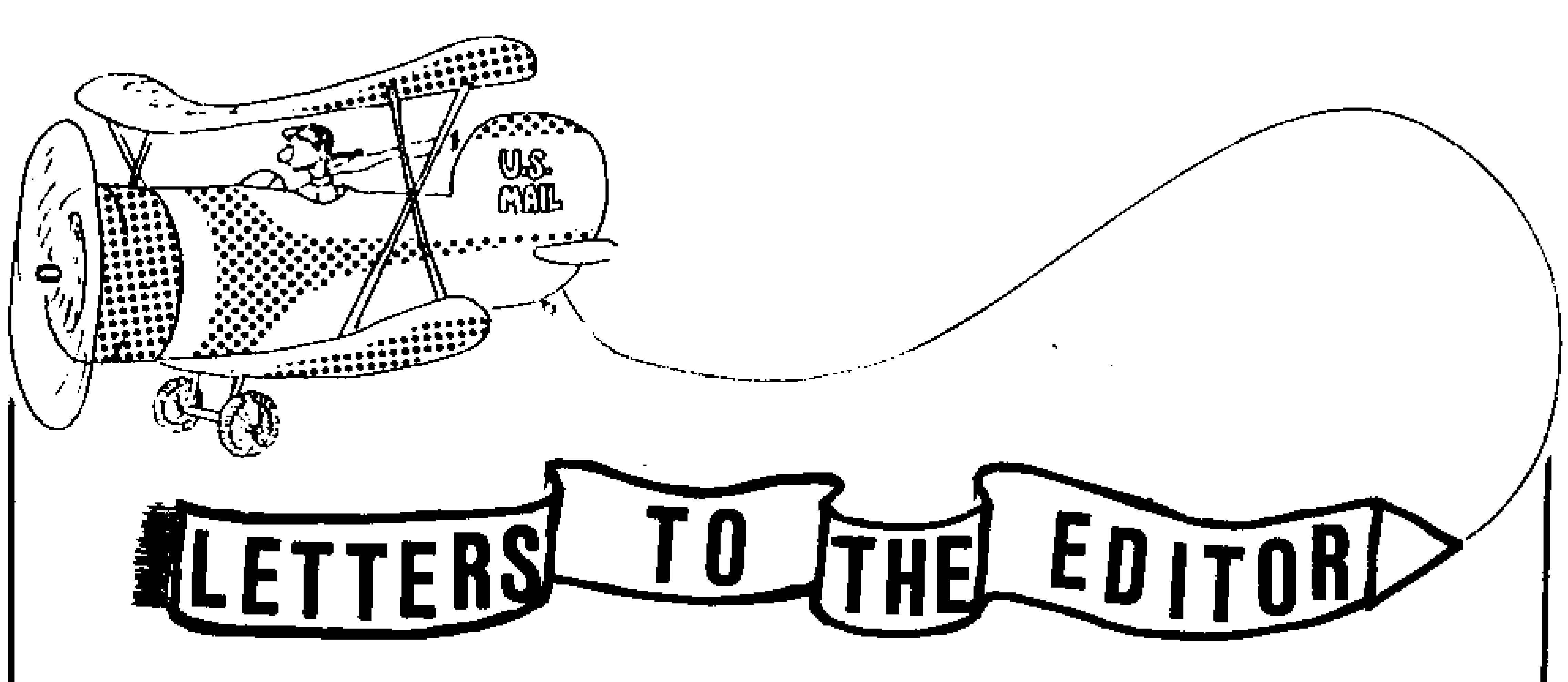
Liaison and behind-the-scenes contracting contributed a vital measure of support to this show's successful production. Bill Hardin of Hardin's Computer Solutions worked with us very closely to ensure that our custom design for the large exhibit islands were correctly manufactured by his firm according to our critical specifications, and were then packed and shipped to us in Oregon in time for last-minute wiring and customizing.

The all-important TI liaison work was handled by Pat Bentley. I'm extremely grateful to Pat for his assistance prior to, during, and after TI-Fest. The logistics involving TI's participation were staggering, and Pat handled it all without a hitch. Special liaison thanks are also extended to John Yantis, who assisted in rounding up seminar speakers, and Jon Campbell of TI Press Relations who assisted me at the show in escorting several TV crews and members of the local press.

I was fortunate to also have local Bay Area support from people like Mary Fesler of the San Francisco TI Learning Center, and Steve Funk of the Personal Computer Association. Special thanks also go out to Bobbie Doyle, sales manager of the San Franciscan—our headquarters hotel, and to Jade Arthur and crew of Greyhound Exposition Services—our patient show decorator.

Now that 99'er TI-Fest is over, and we're back to our daily regimen, I can safely say that I'm looking forward to the *next* show. Having learned quite a lot from the experience, I now even know how to reply when asked a leading question like, "What's a nice magazine like you doing in a place like this?" I simply whip out my cane and derby hat, do a little dance number, and answer, "That's Show Biz . . . "

For the many hundreds of you readers who have telephoned about the availability of the TI-Fest seminar tapes and transcripts, I ask that you remain patient a little longer. We are presently undergoing the monumental task of transcribing the over 50 hours of tapes. Watch for availablity in a forthcoming issue.



LETTERS TO THE EDITOR

Dear Sir:

As an avid reader of your magazine from its onset I have truly enjoyed every issue. I have always enjoyed reading other programmers' program listings to see if I can find shorter, easier or quicker methods of program execution. It never ceases to amaze me that there are so many different ways to program a routine and end up with more or less the same results. I have at times found it difficult to decipher small routines out of the large program listings, with all the GOTOs, GOSUBs and variable value changes.

Based on this, I thought it might be a nice addition to your magazine to have a noncompensatory reader-contributed section on short routines, maybe 25 program statements or less, open to all the languages for the TI Home Computer. I realize that not everyone enjoys programming or typing in lengthy programs but if these routines are kept short in length I feel we could all learn a lot more about the power of our computers.

Here is an Extended BASIC example that sets up a ricocheting sprite in an enclosed area:

```
100 CALL CLEAR :: CALL COLOR(2,6,
    6):: PRINT RPT$("+",252);RPT$
    ("+",252);RPT$("+",56):: R=40
     :: C=30 :: CALL SPRITE(#1,42
    ,2,25,17,R,C)
110 FOR K=1 TO 900 :: CALL POSITI
    ON(#1,Y,X):: R=R+80*((Y+R>200
    )-(Y+R<-1)):: C=C+60*((X+C>25
    0)-(X+C<-1)):: CALL MOTION(#1
    ,R,C):: NEXT K
```

Craig Miller
San Dimas, CA

Thanks for the sample program, Craig. It does indeed show how much power can be packed into a small amount of programming! We are happy to put such examples in this column. We also welcome *articles* which contain short program examples. . .

Dear Sir:

Thank you for publishing such a great magazine. If there is one thing I enjoy more than programming, it's receiving an issue of 99'er Magazine in the mail. It doesn't take me long to read the entire magazine, but I still end up reading it over and over.

Gregory M. Kean
Princeton, NJ

Well, Gregory, now that 99'er is monthly, you should get double the enjoyment!

Dear Sir:

I am a new subscriber and have just recently received all six of your first issues. I am very pleased with them all and I only wish I could have heard of you sooner. It's a real pleasure to read a magazine that not only recognizes that the 99/4A is a computer, but also devotes so much time and space to it.

Ralph Wynn
Virginia Beach, VA

Ralph, I think you were one of the last to receive all the back issues, because the first ones are now out-of-print! Take good care of those copies, their value is going up daily . . .

Dear Sir:

I am a subscriber to your magazine and I think it is the greatest. When we first bought the TI-99/4A, I was disappointed with it in some ways and had been brain washed into thinking that the Apple was the computer everyone wanted and the others were just "toys." Thanks to "99'er" I have overcome this want for an Apple and am really glad we got a TI-99/4A after all.

Also, thank you very, very much for the John Clulow article "Magic Crayon: Learning Assembly Language the Hard Way." It is by far the very best article I have ever read in all the "99'ers." I have all of them and treasure each one. I had all sorts of fears of assembly language until I read that article.

Jim O'Flaherty, Jr.
Denton, TX

Fear of Assembly Language indeed seems widespread. John will be pleased to learn his article was so well received.

Continued on p. 21

Entering 99'er Programs

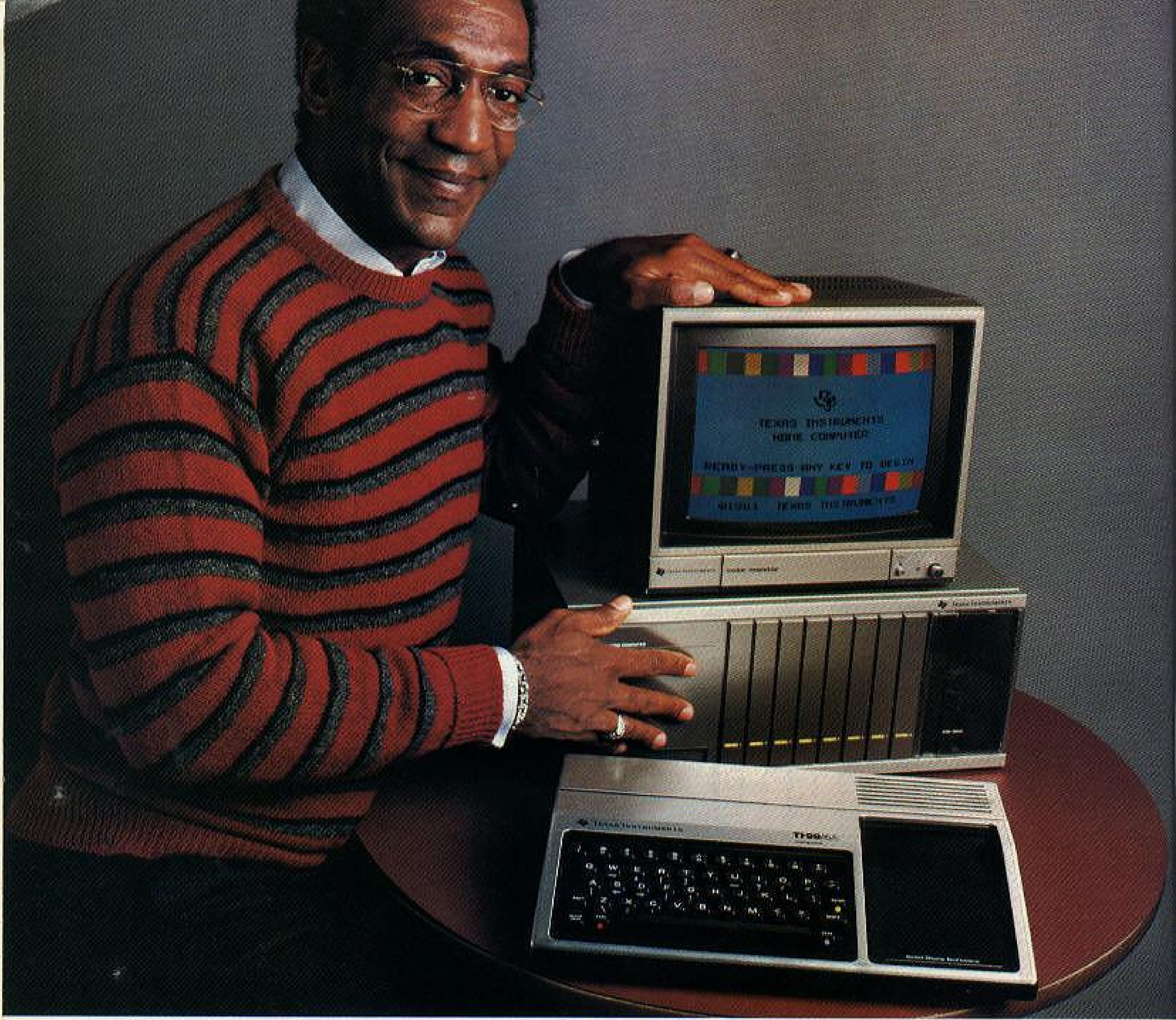
New readers should be aware that within the magazine's pages are found actual computer programs that *you* can put into your Home Computer and enjoy.

Make sure you have any special system components required by the program (i.e., the Speech Synthesizer, Extended BASIC cartridge, etc.). Then, using the console keyboard, you can type the printed magazine listing (character for character, and line by line) into the computer's memory.

Before entering the program, connect a cassette recorder to the computer. Make sure you have two blank cassette tapes. For each 10-20 lines you type in, use SAVE CS1 to save that program segment onto one of the tapes. Alternate between the two tapes each time you save the program. Be sure to rewind to the beginning of each tape before saving, so that you always record over and replace the shorter segment of program lines with the longer segment. By following this procedure, you'll always retain most of your work even if the lights go out or someone turns off the computer.

Double check your typing against the program listing for errors, and *then* have someone else check it. The most common errors are typing the letter "O" instead of the number "0" (zero)—they are *not* interchangeable to the computer. This is also true for the letters "I" and "L" and number "1" (one). (See "Key-In Reference" on p. 4)

Every time you make a correction to your program, SAVE CS1 and switch the tapes. Once all the errors are corrected, you will have a good copy of the program on the last tape. Before turning off the computer, put the other cassette tape in your recorder and once again SAVE CS1. Now, if one tape gets damaged, you won't have to enter the program listing via the keyboard all over again. Have fun and happy computing.



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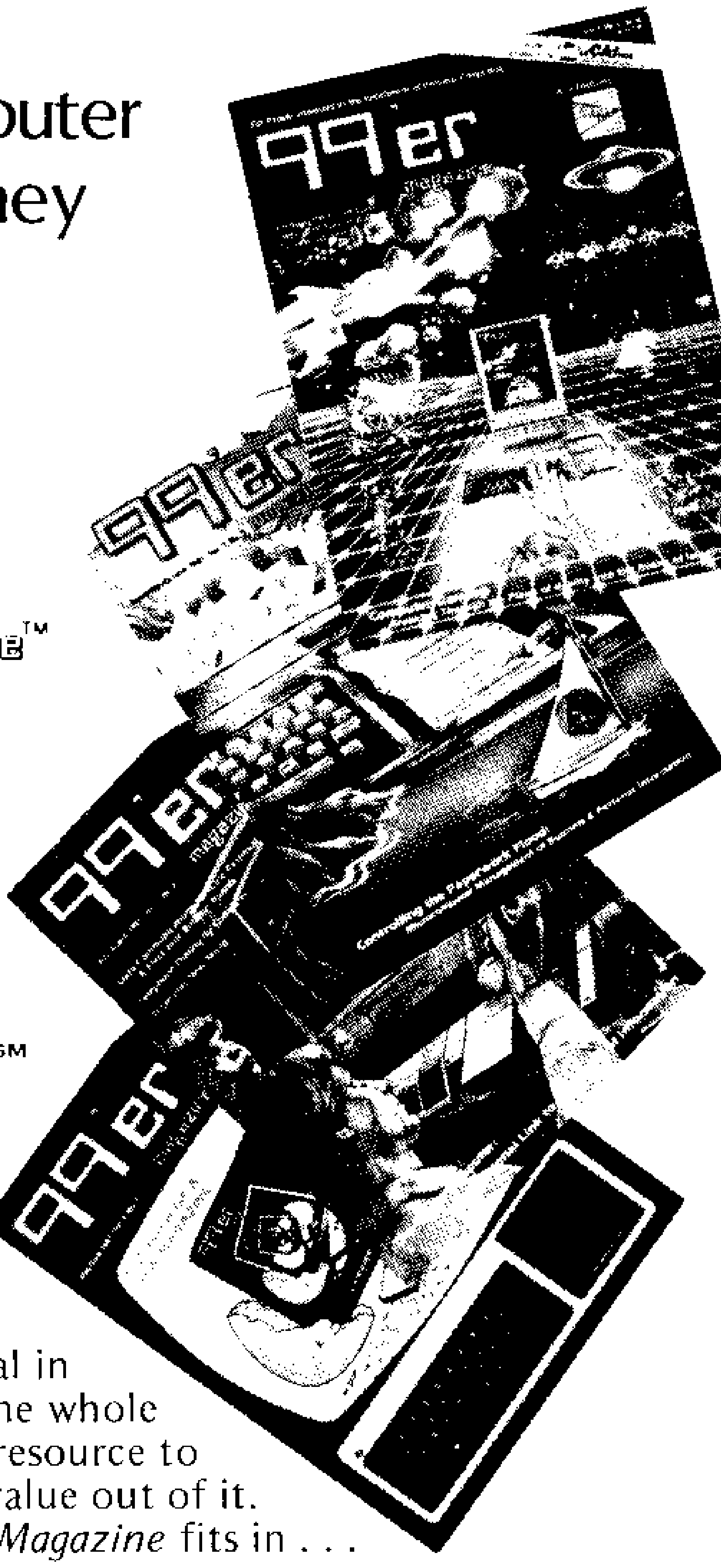

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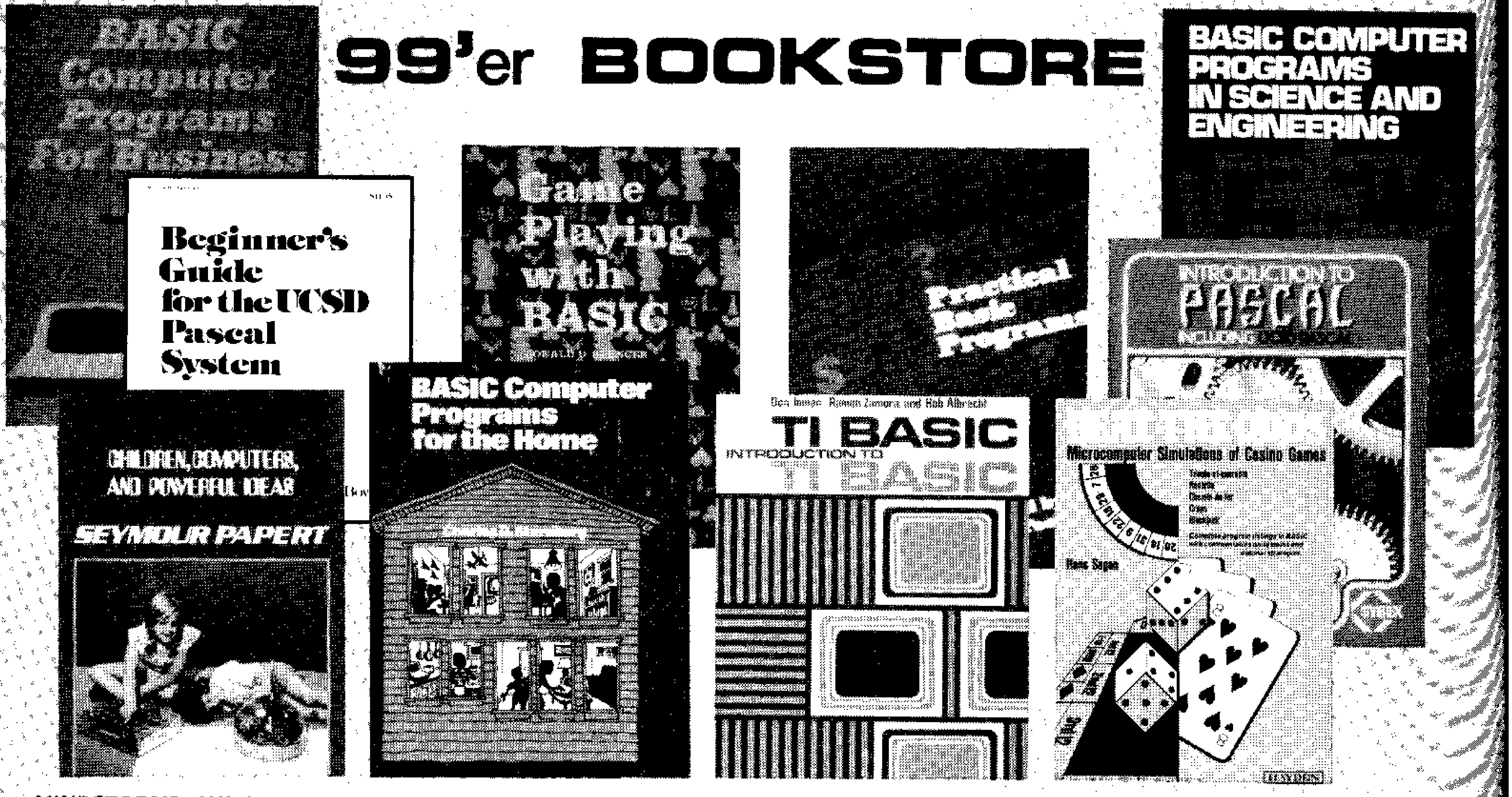
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MINDSTORMS: CHILDREN, COMPUTERS AND POWERFUL IDEAS

By Seymour Papert

The definitive work on the philosophy behind LOGO. Excerpted in the Vol. [illegible] No. [illegible] issue of this magazine.

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INTRODUCTION TO TI BASIC

By D. Inman, R. Zamora,
and R. Albrecht.

This comprehensive work will teach you all about computers and BASIC for use with the Texas Instruments Home Computer. Even if you've never worked with a computer, you can now teach yourself how to use, program and enjoy the TI Home Computer with this entertaining, and easy-to-read work. The authors have carefully constructed this introduction so that you will soon be writing BASIC programs and exploiting all of the excellent features of the TI machines. Its 14 chapters and Appendices cover all of the essential programming statements and machine features.

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By Hans Sagan.

Here's an extremely useful programming guide that provides realistic simulations of five popular Casino games: Trente-et-Quarante (Thirty and Forty), Roulette, Chemin-de-Fer, Craps, and Blackjack. Each of the five chapters has the same structure. It begins with a computer run, displaying facets of the programs, followed by an explanation of the objectives and the physical execution of the game. Acceptable bets and how to place them are discussed and systems and/or strategies laid out. Finally, the computer program is developed and various modifications of the program are detailed.

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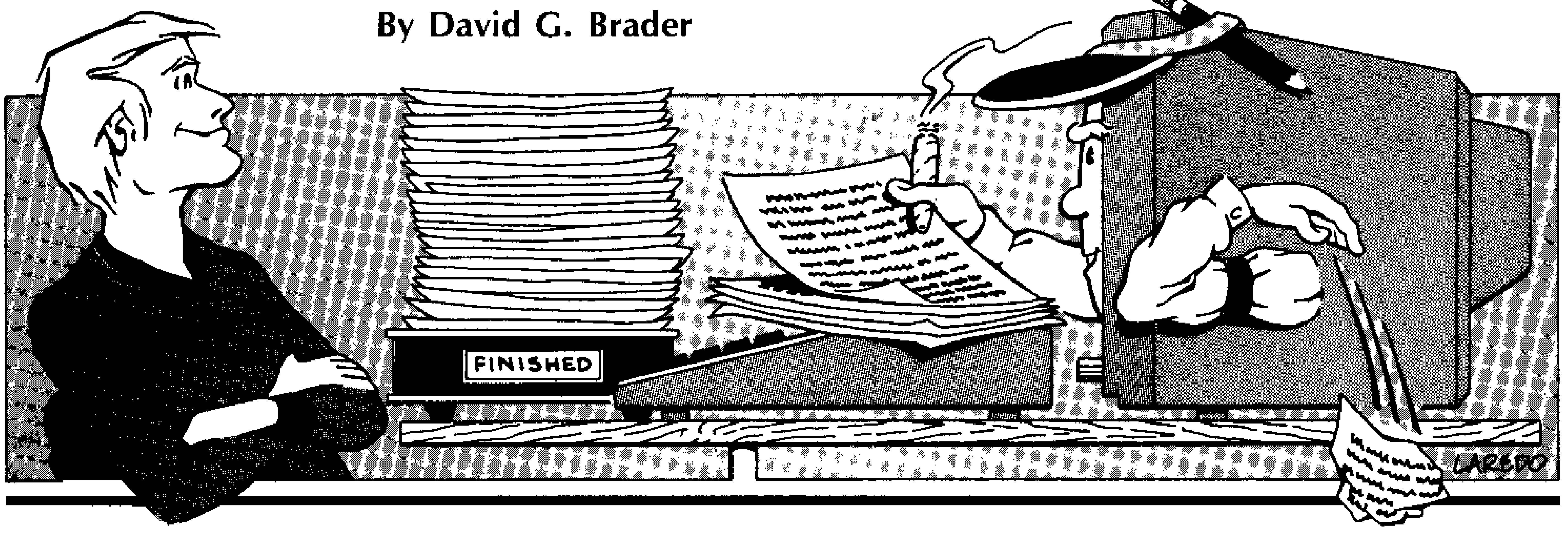
Tex-Scribe: A Text Editor for the Home Computer

By David G. Brader



You may picture a Text Editor as a cigar-smoking man in a green eyeshade working at a paper-littered desk in some big-city newspaper office. But the type of text editor covered in this article is *not* human. . . It is a computer program that works on the TI Home Computer—a *tool* for speeding the creation and modification of text information. If John Milton had been able to utilize such a text editor, he just might have finished *Paradise Lost* before going blind!

A text editor is more versatile than a simple typewriter. Its real power is that it can change text at any time after it has been entered. If you enter a word wrong, you can correct it without eraser crumbs or unevenly-spaced letters. You can *even* shuffle paragraphs and delete lines without having to retype the text!

Tex-Scribe (the nickname for this text editor computer program) lets you enter, save, retrieve, and print text using the TI Home Computer system. It is written in TI Extended BASIC and will work with both versions currently available. It is not recommended for use with the old TI-99/4 because it was designed around the keyboard features of the TI-99/4A.

Table #1

1. **DELETE A LINE** of text from the file in memory.
2. **INSERT A LINE** of text into the file in memory.
3. **REPLACE A LINE** of text in the file in memory.
4. **CLEAR** the **FILE** work space in memory.
5. **ADD LINES** of text to the end of the file in memory.
6. **SAVE** the **FILE** in memory to cassette or diskette.
7. **LIST** the **FILE** as it is stored in memory to screen or printer. (This allows you to view all the special non-printable characters like those shown in table 3.)
8. **LOAD** a **FILE** from cassette or diskette.
9. **REPLACE** a **STRING** of characters in the file in memory.
0. **PRINT** the **TEXT** of the file in memory in final form on the printer.

What Do I Need to Use Tex-Scribe?

For greatest flexibility, I recommend the following configuration:

TI-99/4A Home Computer console
TI Extended BASIC Command Cartridge
Color Monitor
TI Peripheral Expansion Box
TI Disk Drive Controller Card
Disk Drive (one or more)
TI 32K Memory Expansion Card
TI RS232 Interface Card
TI 99/4 Impact Printer

With this setup, you can put Tex-Scribe in the DSK1.LOAD disk file. Than it will automatically LOAD and RUN when you select TI Extended BASIC. This system configuration allows you to keep about 150 eighty-character lines in memory at one time.

The minimum system that Tex-Scribe will work with is:

TI-99/4A Home Computer console
TI Extended BASIC Command Cartridge
TV set and the RF Modulator
Cassette recorder
TI Thermal Printer

This second configuration severely limits the practical usage of the program, but it will work.

The Tex-Scribe program listing is set up for the TI-99/4 Impact Printer. If you have a different printer or if your printer is set up differently, you may have to change the lines that are bounded by "REM $$$$$$$...." statements. Tex-Scribe presently *talks to* printer device name "RS232.DA=8.BA=9600".

If you are using the TI-99/4 Impact Printer, Table 2 is a handy reference for controlling some of the most popular print modes. If you have a different printer, you will need to refer to its manual.

What Can Tex-Scribe Do?

There are ten main commands listed in Table #1. When Tex-Scribe is ready for your command selection, the prompt ACTION? appears on the TI-99/4A screen. Then you may select a specific command by pressing its corresponding number key followed by the ENTER key.

Because Tex-Scribe only displays the command list when first RUN and when an illegal selection is made, you will find it useful to cut out Figure 1 and tape it just above the number keys on your TI-99/4A console.

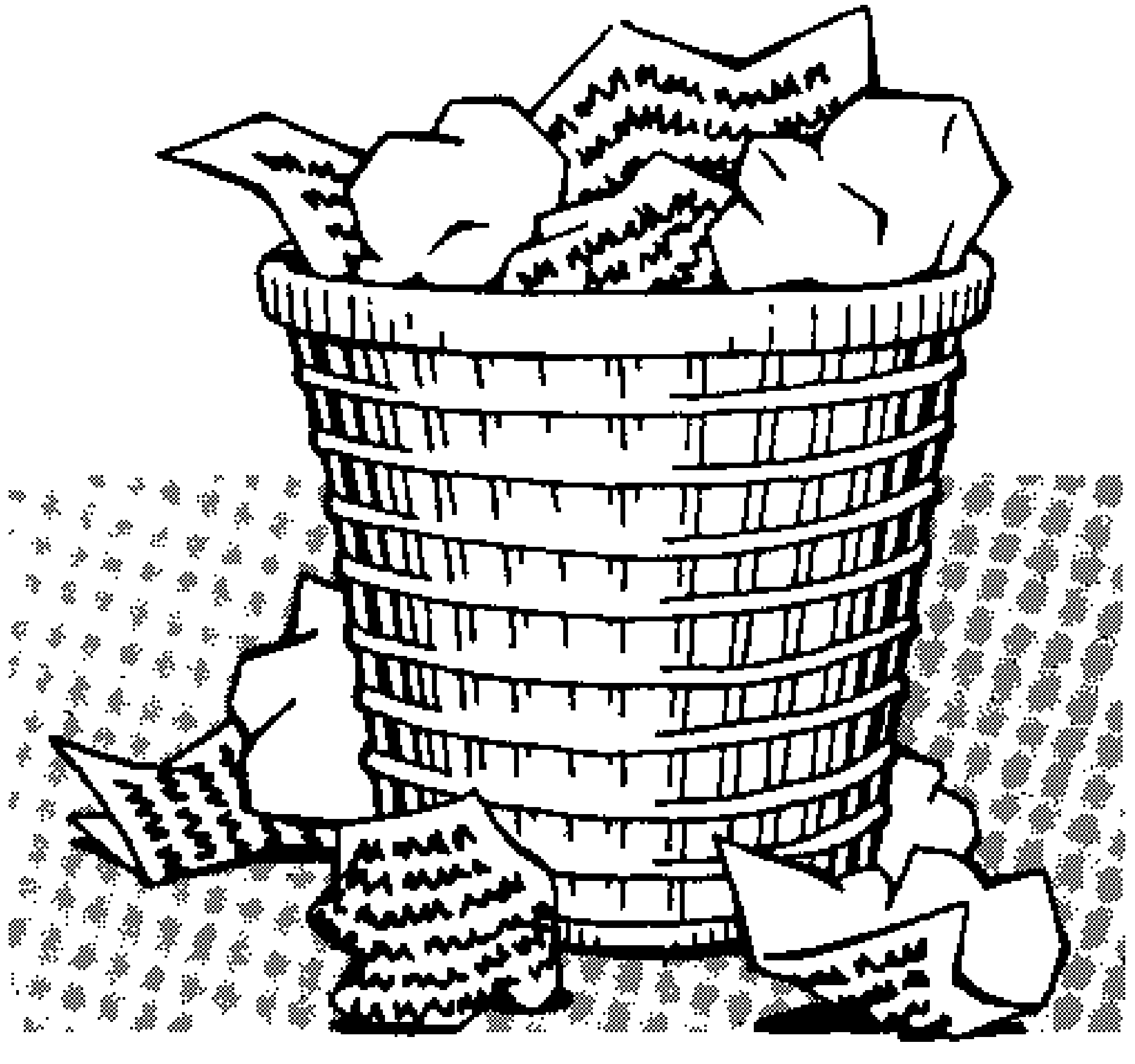
Then, by glancing at the labels over the number keys, your choice is clear for responding to the ACTION? prompt.

Before describing each command's usage in detail, here is a summary of Tex-Scribe's other capabilities.

To Forgive and *Not* Forget

Tex-Scribe will *not* die if you over-stuff the computer's memory with text, leave a disk out of the disk drive, or make some other type of normally *fatal* error. It recovers and gives you a second chance. However it *cannot* survive the mistake of using the QUIT command. . .

Continued on p. 16



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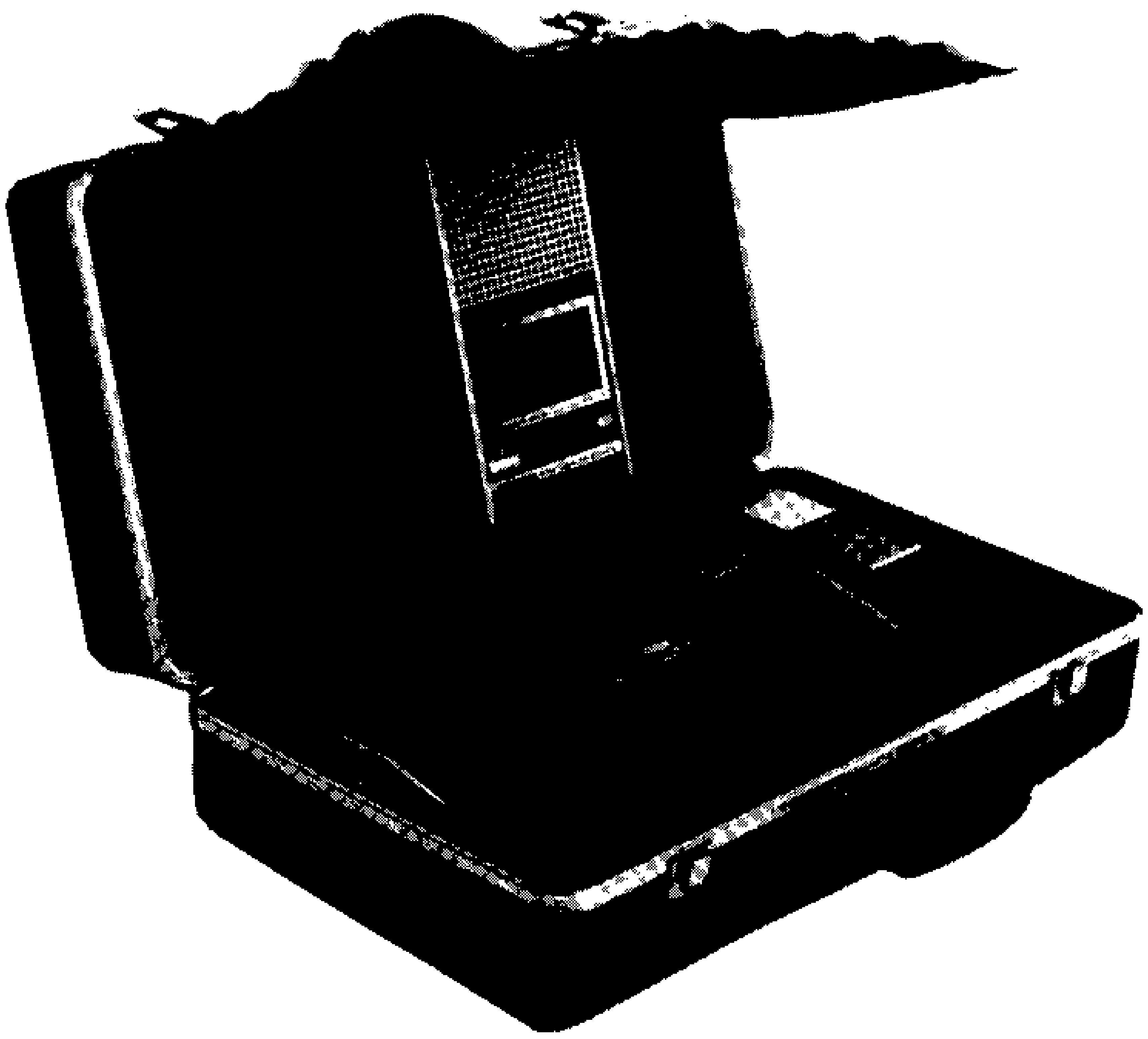

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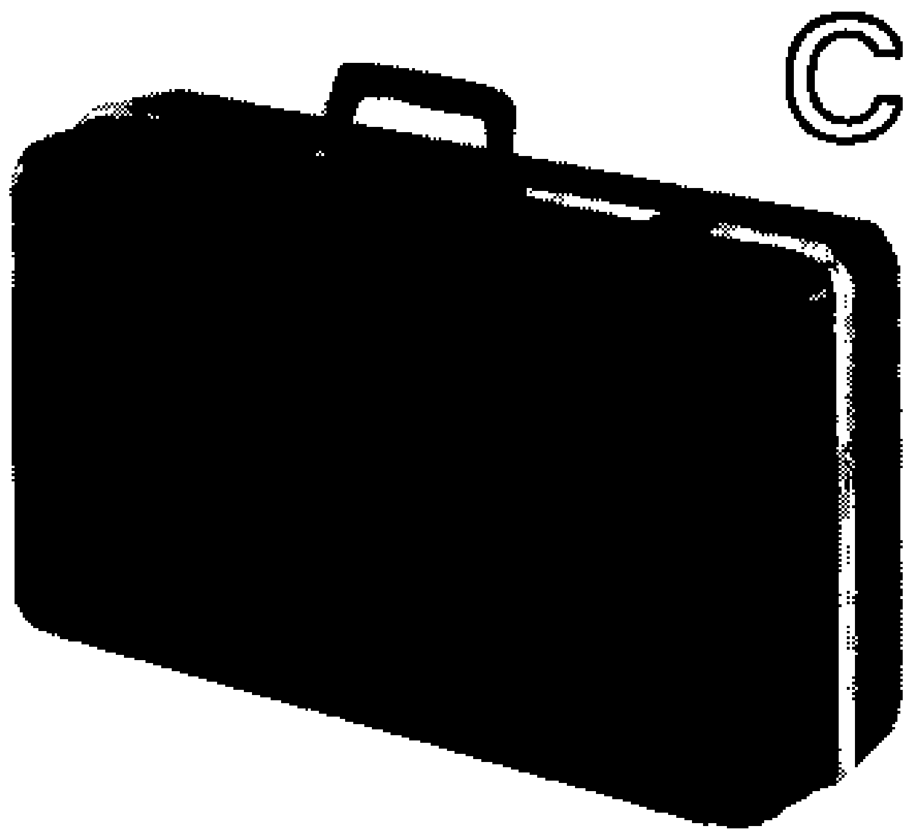

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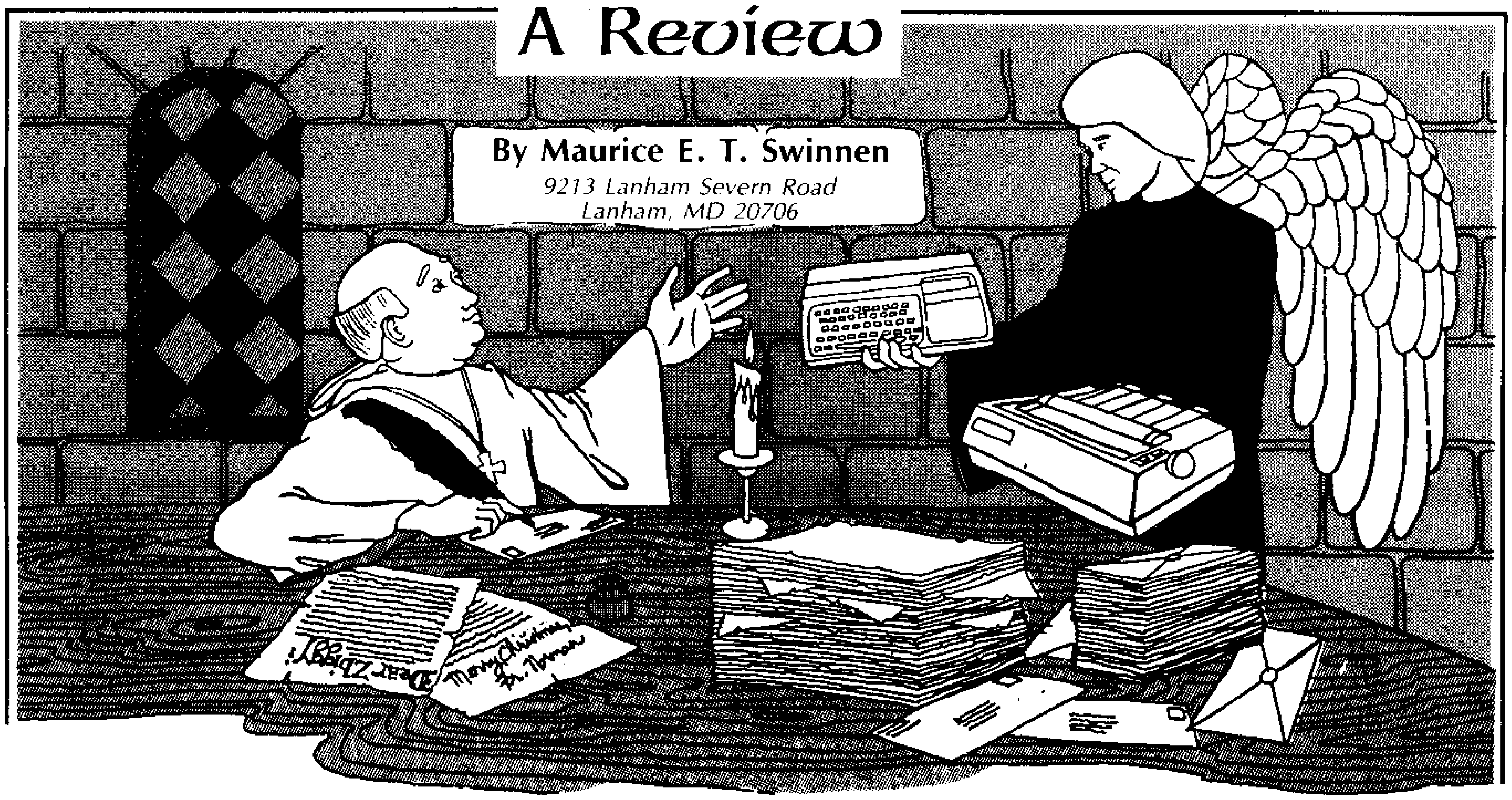
Managing a Mailing List the Futura Way: A Review



By Maurice E. T. Swinnen
9213 Lanham Severn Road
Lanham, MD 20706

Anyone who has used TI's Mailing List programs has experienced the utter frustration of waiting and waiting for the program to condense a few hundred names, to sort them by Zip code, and to find a name. In addition, to locate a name it had to be spelled exactly as entered in the computer some months before. If that sounds easy, just try to remember the exact spelling of Zbigniew Morasczewski.

But rejoice! There is a "new kid on the block" who knows what he is doing. Charles Ehninger of Futura Software, P. O. Box 5581, Fort Worth, TX, 76108, has written a superb Mailing List program in Extended BASIC. Much faster than anything you have seen before, it sells for $49.95 and is worth every cent.

His programs require a Memory Expansion and at least one disk drive. Two disk drives are much better, of course, but one will do if you don't mind changing diskettes often. Of course, you will also need some sort of printer for your addresses in label and/or report form. Mr. Ehninger tells me the TI-810 printer is ideal, but I have had good results with the Epson MX-80, the IDS 440 Paper Tiger and even with the Olympia ES-100-R0 electronic typewriter that sports an RS-232 interface.

> **"The Program displays nice lined boxes on the screen, the cursor in one of them. It tells you what to put in each box so that you can wander among them and distribute your information."**

In the Beginning. . .

When you insert the diskette and select Extended BASIC, the *MENU* program loads automatically. It offers 11 choices, 1 through 9, plus A and B. But before you are given the menu, you have to sit through something rather boring—the title screen. I would have left it out of this otherwise excellent program. But, as consolation, the title appears only when you fire up the system; by the time you have poured your first cup of coffee, it mercifully has disappeared from the screen for the rest of the day.

The first item you have to select from the menu—you do that only once—is the COMPUTER ENVIRONMENT. This allows us to describe our computer system for the program, i.e. type of printer, number of disk drives, and so on.

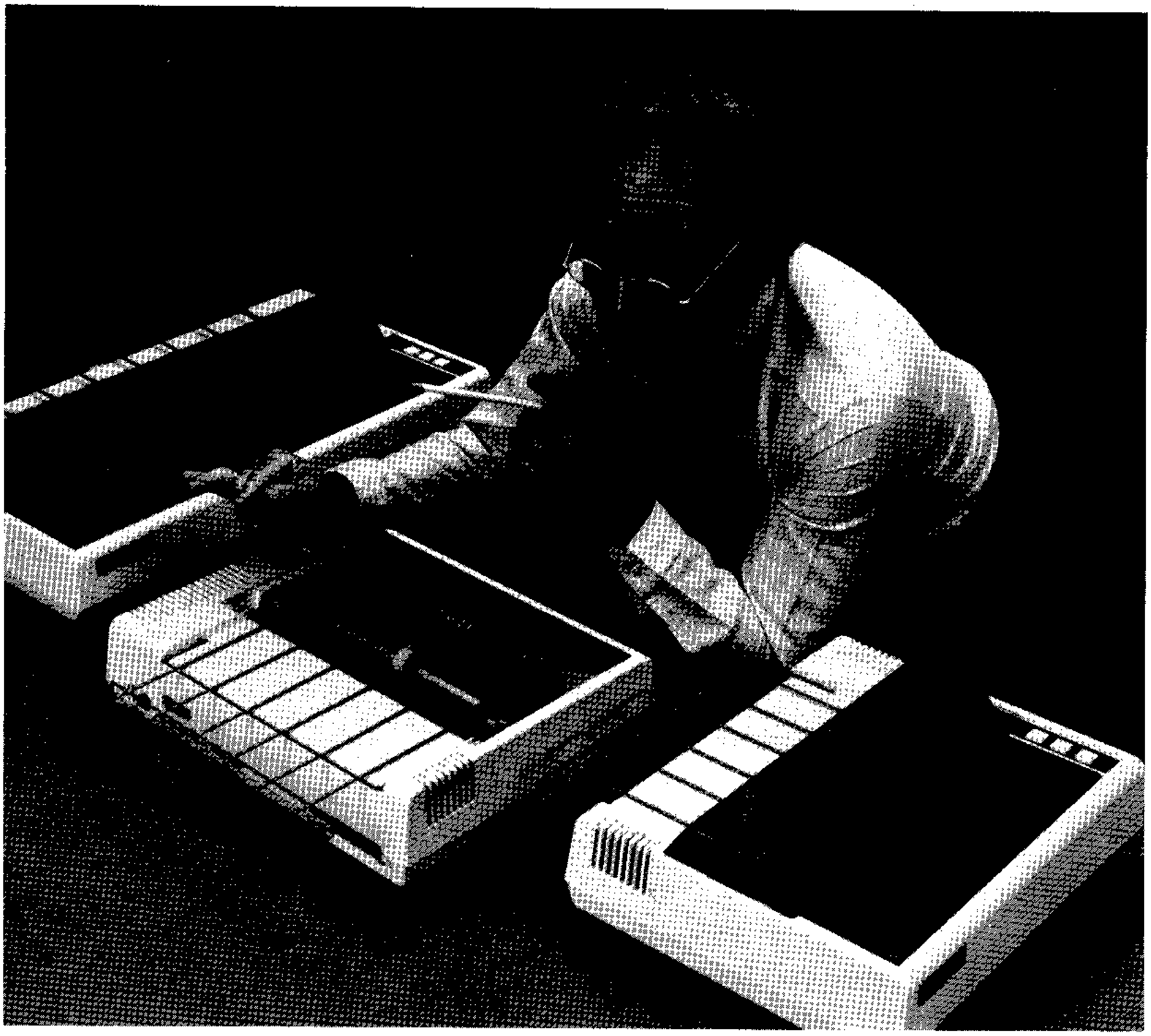
Your next choice, without a doubt, is FILE MAINTENANCE. This program allows you to initialize your data diskette files, set up the various classes and, later perhaps, to add, delete or change classes. Initializing a data diskette requires a little patience—six minutes to be exact. Meanwhile the screen entertains you by displaying the number of the current record being initialized.

Updating Your Name File

Next on your list you will want to select ADD/CHANGE/DELETE/LOOKUP. As the name implies, you may now enter (add) new names and addresses, change existing ones, delete some of them or look them up. Now, this part is real *fun* to do. In reality it is *sheer delight*. The program displays nice lined boxes on the screen and the cursor in one of them. It tells you what to put in each box so you can wander among them and distribute your information.

Personally, I like order. I would have lots of trouble driving on the highway if it weren't for the white lines in the middle. They make for a kind of constant pat on the back, saying "You are doing alright, old boy. Just keep on." The same can be said for the boxes. You know exactly where you stand and how much information you may put in each box. If you try to exceed the limits (yes, I will try that too, once in a while) a gentle, but firm semi-raspberry tone will nudge you back where you belong. Now, that is what I mean by *order*.

Continued on p. 36



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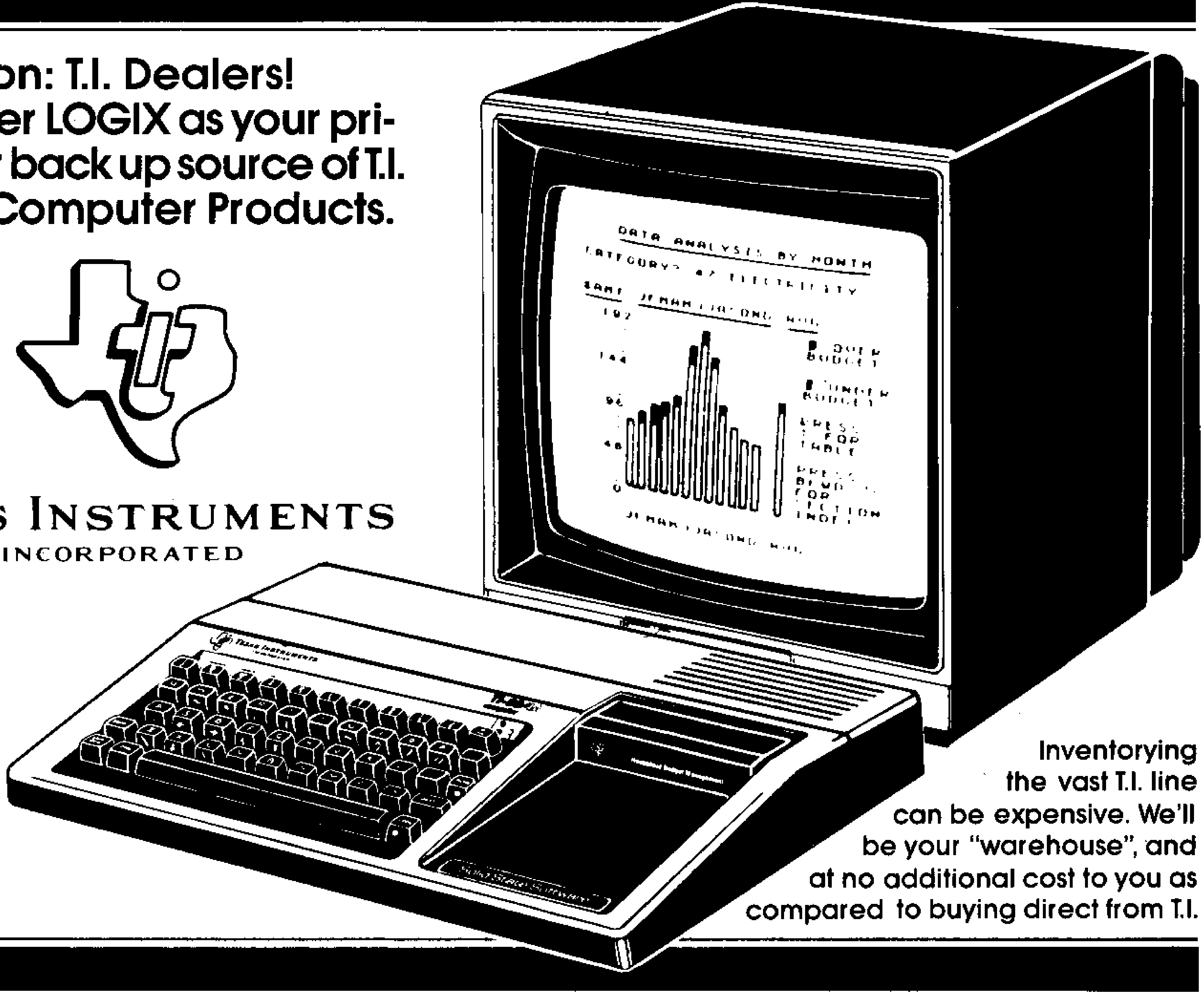

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A CHRISTMAS COMPUTER CAROL

FA-LA-LA-LA-LA!
LAREDO

By Steve Davis
4232 Rawlins #101
Dallas, TX 75219

'Twas the night before Christmas,
The same OLD Routine,
Just waiting for something
To come on the Screen.

My programs were Loaded
From tape with great care,
In the hopes that when RUN
There would be no Error.

In a CALL SOUND Routine
There arose such a clatter,
I typed in a BREAK to see
What was the matter.

I then ran a LIST,
I was checking it slow,
Found not a GO TO,
But instead a TO GO.

When what to my wondering
Eyes should appear,
But 8 K of Memory,
Give or take a Byte here.

With a brand NEW program
That ran oh so quick,
I knew it was written by
Jolly St. Nick.

More rapid than Memory
His Cursors they came;
In a SOUND Subroutine,
He CALLed them by name:

"On Floppy, On FOR-NEXT,
Now Cassette and Printer,
On RANDOM, on COSine,
Let's go while it's winter."

To the top of the screen
They Scrolled at his CALL,
"Now DISPLAY, Now DISPLAY,
Now DISPLAY, you all!"

He wrote not a word,
But went straight to his work
Of DISPLAYing graphics
Without any jerk.

And when I hit ENTER,
That dear little man
Paused and played Trek Wars
As only he can.

Then he ENDed the program,
Packed up his Print-Out,
And as the screen CLEARed,
I thought I would shout.

But I heard him REMark
As he flew like a Sprite,
"Merry Christmas to all,
And to all a good BYE!"

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TEX-Scribe . . . from p.9

You Set the Line Length

You are allowed to set the number of characters per line when Tex-Scribe is first started, after a LOAD FILE command, and after an illegal response to the ACTION? prompt.

For cassette storage, the maximum line length is 192 characters; for diskette storage, the maximum is 254 characters. The default line length is set to 80 characters.

If you exceed the limit that you have chosen when entering a line of text, Tex-Scribe will truncate the line back to the nearest full word and display the result.

Build Documents

You can merge several short files of text into memory by using selection number 8, LOAD FILE. This allows you to, for example, build a letter by loading a *letterhead* disk/cassette file, entering text directly from the keyboard, and merging a standard *closing* disk/cassette file.

Re-Arrange Paragraphs

Tex-Scribe's SAVE FILE command lets you save any range of text lines from memory to storage. You can move paragraphs in the text by using these partial file SAVEs to *separate* disk/cassette files (clearing the memory) and then re-merging them (using LOAD FILE) into memory in the new order.

Printer Controls

The TI-99/4A CTRL key can be used to generate the special command sequences needed to cause printers like the new TI-99/4 Impact Printer to do its neat tricks, such as emphasized or italics printing (see Tables 2 and 3).

Using the Tex-Scribe Functions

Let's suppose that you have loaded the program from either the 99'er Magazine-On-Tape cassette or through painstaking keyboard entry. If you have a disk system, you may save the program on a file called DSK1.LOAD. Once you have created this disk file, turn off the console, wait a few seconds and then turn it back on. Now select Extended BASIC and wait patiently for the program to start automatically (about 45 seconds).

The Tex-Scribe *menu* of commands should now show on the screen along with the line-length-setting question. For now, we will just press ENTER to accept the default length of 80 characters. After a slight pause, the ACTION? prompt appears.

Let's start building a text file. Do this by selecting the ADD LINES command—Press the number 5 key, then press ENTER.

Now we are ready to type lines of text into the file. Make a note of what you see on the screen. The only way to leave this ADD LINES command is by typing two up-arrows (ΛΛ) on a line by themselves, followed by ENTER.

In this command you can make changes only to the line you are currently entering. To make changes to a line previously entered you must get out of this command and use another command (DELETE A LINE, REPLACE A LINE, or REPLACE STRING).

Type in the following line:

```
 The dog chased the cat up
the big oak tree in the yard
only to find that the cat
could reach the roof of the
house.
```

Now press ENTER. Because the line was longer than the 80 character length specified, Tex-Scribe truncated and re-displayed the line for you. Now you may enter the rest of the sentence on line two and press ENTER. On line three just enter the two up-arrows (ΛΛ) and press ENTER. Now we have something to work with in the memory.

Enter a 2 in response to the ACTION? prompt, for the INSERT A LINE command. Insert a line before line one. Enter anything you like here and note that after the new line is entered, the line numbers in memory are resequenced. The new line is now line one, the old line one is now line two, etc.

Next, say that we made a mistake in our text. We really wanted to say "pink rat" everywhere we said "cat." Press number 9, the REPLACE STRING command. Enter "cat" for the string to replace. Enter "pink rat" for the new string. Before the search is started, you are asked the range of lines to look at for the string "cat". Select "0" to have all lines searched. At the first occurence of "cat" in any line, the string "pink rat" is substituted. Each modified line shows on the screen.

Notice that on the end of each line are the characters LFCR? The LF stands for *line feed* and the CR stands for *carriage return.* Tex-Scribe always converts any *non-printable* characters (which are usually control codes to the printer) to mnemonics when it displays the line to the screen or in response to a LIST FILE command to the screen or printer.

Speaking of LIST FILE, select number 7 and list all the text in memory to the printer. Notice that the line numbers and non-printable characters are there in addition to the text you entered. This command is used to guide you through text modifications; it shows you exactly what is in the memory. This command allows you to select the range of lines to list; once again, "0" will cause all lines to be selected.

Select command number 6, SAVE FILE and choose your storage device. If it is the disk, store the text into disk file JUNK. Now you are safe. If you desire, you may turn off the power and continue tomorrow.

Select CLEAR FILE command (number 4) which erases the text in the memory.

Table 2 — TI-99/4 Impact Printer — Mode Commands

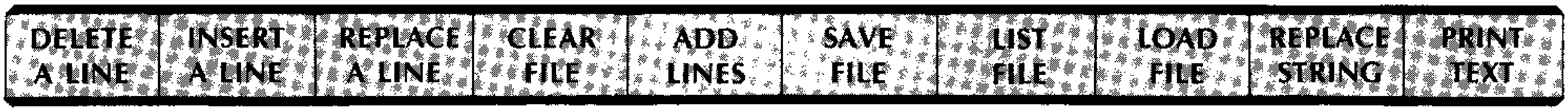
HOLD + PRESS	then	PRESS for	FUNCTION
CTRL	O		Set **16.5 cpi** mode
CTRL	R		Cancels 16.5 cpi mode
CTRL	N		Set 5 cpi mode
CTRL	T		Cancels 5 cpi mode
CTRL	.	4	Sets the *ITALICS* mode
CTRL	.	5	Cancels the ITALICS mode
CTRL	.	E	Sets the **emphasized** mode
CTRL	.	F	Cancels the emphasized mode
CTRL	.	G	Sets the **double strike** mode
CTRL	.	H	Cancels the double strike mode

Table 3

Non-Printable Character Definitions

MNEMONIC	99/4A KEY SEQUENCE	CHARACTER DEFINITION
SOH	hold CTRL&letter A	Start of heading
STX	hold CTRL&letter B	Start of text
ETX	hold CTRL&letter C	End of text
EOT	hold CTRL&letter D	End of transmission
ENQ	hold CTRL&letter E	Enquiry
ACK	hold CTRL&letter F	Acknowledge
BEL	hold CTRL&letter G	Ring bell (or beep)
BS	hold CTRL&letter H	Backspace
HT	hold CTRL&letter I	Horizontal tabulation
LF	hold CTRL&letter J	Line feed
VT	hold CTRL&letter K	Vertical tabulation
FF	hold CTRL&letter L	Form feed
CR	hold CTRL&letter M	Carriage return
SO	hold CTRL&letter N	Shift out
SI	hold CTRL&letter O	Shift in
DLE	hold CTRL&letter P	Data link escape
DC1	hold CTRL&letter Q	Device control 1 (X-ON)
DC2	hold CTRL&letter R	Device control 2
DC3	hold CTRL&letter S	Device control 3 (X-OFF)
DC4	hold CTRL&letter T	Device control 4
NAK	hold CTRL&letter U	Negative acknowledge
SYN	hold CTRL&letter V	Synchronous idle
ETB	hold CTRL&letter W	End of transmission block
CAN	hold CTRL&letter X	Cancel
EM	hold CTRL&letter Y	End of medium
SUB	hold CTRL&letter Z	Substitute
EXC	hold CTRL & "."	Escape
FS	hold CTRL & ";"	File separator
GS	hold CTRL & "="	Group separator
RS	hold CTRL&number 8	Record separator
US	hold CTRL&number 9	Unit separator

FIGURE 1



Try LIST FILE to the screen now . . . As you can see the memory is empty.

Because the memory is empty, this is a good time to try the LOAD FILE command. Select number 8 and the device you are using for storage. If it is the disk system, load from the JUNK file. After loading, you are again asked to choose the length of line. Complete that task, and select the LOAD FILE command one more time. Now Tex-Scribe gives you a warning. Because you already have something in memory, you have a chance to CLEAR the FILE or MERGE a FILE from disk (or cassette) with the lines already in memory. Select "M" for MERGE and continue to load the JUNK file again.

Let's PRINT TEXT to see what is in the memory now. Select number 0. This command prints faster than the listing function because Tex-Scribe doesn't have to slow down for translation of the non-printable characters. Use this command to print the final results of all your text editing.

Select number 1 for the DELETE A LINE command. When asked, select a line to delete. Use LIST FILE to list the memory to the printer again. Note that the file is resequenced *without* the deleted line.

The only command not yet tried is number 3, REPLACE A LINE. Go ahead and select it. Have you noticed that the screen turns red when you select a command that modifies text? That is to keep you awake during such modifications! Type in a replacement for line 3. Now PRINT TEXT to the printer to see the difference.

Well, that's the course. You now have a simple, modern *wordsmith's* tool kit at your disposal. The more you use it, the more useful it becomes.

EXPLANATION OF THE PROGRAM
Tex-Scribe

Line Nos.	
100-180	Rem's: title, and version.
190	Disable sprites. To be used only with expansion memory.
200-320	Initialize variables.
330-390	Reset printer.
400-460	Initialize variables.
470-560	Display menu screen.
570-660	Enter command, and branch to subroutines.
670-810	Delete line subroutine.
820-1000	Insert line subroutine.
1010-1150	Replace line subroutine.
1160-1220	Clear file in memory.
1230-1370	Add lines to file.
1380-1570	Save file to storage device.
1580-1720	List file subroutine controle.
1730-1820	Set up output file, and initialize printer.
1830-1870	Print file records.
1880-1930	Restore printer to normal.
1940-2200	Load or merge file from storage device.
2210-2530	Subroutine to replace a string within the file.
2540-2730	Print text from the file to the printer.
2740-2880	Format source file for output.
2890-3020	Input file from keyboard.
3030-3150	Locate line from file and display on the screen.
3160-3350	Subroutine to set the range on the file.
3360-3440	Subroutine to load a file from cassette.
3450-3530	Subroutine to save a file to cassette.
3540-3640	Subroutine to load a file from disk.
3650-3740	Subroutine to save a file to disk.
3750-3890	Disk file select subroutine.
3900-4040	Error handling and recovery subroutine.

```
100 REM ********************
110 REM *     TEX-SCRIBE   *
120 REM *         BY       *
130 REM *  DAVID G. BRADER *
140 REM ********************
150 REM 99'ER VERSION 2.2.1XB
160 REM
170 REM --- INITIALIZATION OF SCRIB
    E
180 REM --- KILL SPRITES (FOR SPEED
    )
185 REM ******** DELETE LINE 190 IF
     YOU DO NOT HAVE 32K MEM. EXPAN
    SION. ********
190 CALL INIT :: CALL LOAD(-31878,0
    )
200 REM
210 OPTION BASE 1
220 REM
230 DIM A$(200),C$(31)
240 REM
250 REM  --- DATA FOR COMMAND LOOKU
    P TABLE
260 REM
270 DATA NUL,SOH,STX,ETX,EOT,ENQ,AC
    K,BEL,BS,HT,LF,VT,FF,CR,SO,SI,D
    LE,DC1,DC2,DC3,DC4
280 DATA NAK,SYN,ETB,CAN,EM,SUB,ESC
    ,FS,GS,RS,US
290 REM
300 FOR I=1 TO 31
310 READ C$(I)
320 NEXT I
330 REM
340 REM $$$$$$ NOTE THAT STATEMENTS
     BRACKETED BY DOLLAR SIGN REM
350 REM $$$$$$ STATEMENTS, MAY REQU
    IRE MODIFICATION FOR YOUR PRINT
    ER.
360 REM
370 REM $$$$$$$$$$$$$$$$$$$$$$$$$$$$
    $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
    $$$$$
380 RESET@EPSON$=CHR$(18)&CHR$(20)&
    CHR$(27)&CHR$(70)&CHR$(27)&CHR$
    (72)&CHR$(13)&CHR$(27)&"5"
390 REM $$$$$$$$$$$$$$$$$$$$$$$$$$$$
    $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
    $$$$$
400 LFCR$=CHR$(10)&CHR$(13)
410 WIDTH=80
420 REM
430 CALL CLEAR
440 CALL SCREEN(16)
450 REM
460 MEM$="<<< SORRY, MEMORY FULL >>
    >"
470 REM --- MENU
480 REM
490 CALL CLEAR
500 DISPLAY AT(3,1):"  ***     TEX-
    SCRIBE     ***        Command fu
    nctions"
510 DISPLAY AT(7,1):"1-Delete 2-Ins
    ert 3-Replace    a line    a line
       a line"
520 DISPLAY AT(10,1):"4-Clear   5- A
    dd   6-Save       file       line
    s   file"
530 DISPLAY AT(13,1):"7-List    8-Lo
    ad   9-Replace   file      file
       a string"
540 DISPLAY AT(16,1):"0-Print the t
    ext of file"
550 DISPLAY AT(20,1):"HOW MANY CHAR
    ACTERS PER      LINE DO YOU WANT
    ?";WIDTH
560 ACCEPT AT(21,19)VALIDATE(DIGIT)
    SIZE(-3):WIDTH
570 IF (WIDTH<1)OR(WIDTH>254)THEN 5
    50
580 PRINT
590 ON ERROR 3920 :: CALL SCREEN(16
    ):: INPUT "ACTION ? ":M
600 IF M=-1 THEN 4040 :: M=M+1
610 IF (M<1)+(M>10)=-1 THEN 620 ELS
    E 640
620 CALL CLEAR :: CALL SCREEN(12)::
     DISPLAY AT(1,1):" <<<< SELECTI
    ON ERROR >>>>"
630 GOTO 500
640 ON M GOSUB 2540,670,820,1010,11
    60,1230,1380,1580,1940,2210
650 CALL SCREEN(4):: IF M=9 THEN CA
    LL CLEAR :: GOTO 550
660 GOTO 580
670 REM --- DELETE A LINE
680 REM
690 CALL SCREEN(10)
700 IF L>0 THEN 730
710 PRINT :" *** FILE EMPTY ***":
720 GOTO 810
730 GOSUB 3030
740 IF B=0 THEN 810
750 L=L-1
760 FOR I=B TO L
770 A$(I)=A$(I+1)
780 NEXT I
790 A$(L+1)=""
800 PRINT :"Deleted, file renumbere
    d":
810 RETURN
820 REM --- INSERT A LINE
830 REM
840 CALL SCREEN(16)
850 IF L>0 THEN 880
860 PRINT :" *** FILE EMPTY ***":
870 GOTO 1000
880 PRINT :"Insert before"
890 GOSUB 3030
900 IF B=0 THEN 1000
910 PRINT :"Enter new line-"
```

Continued on p. 52

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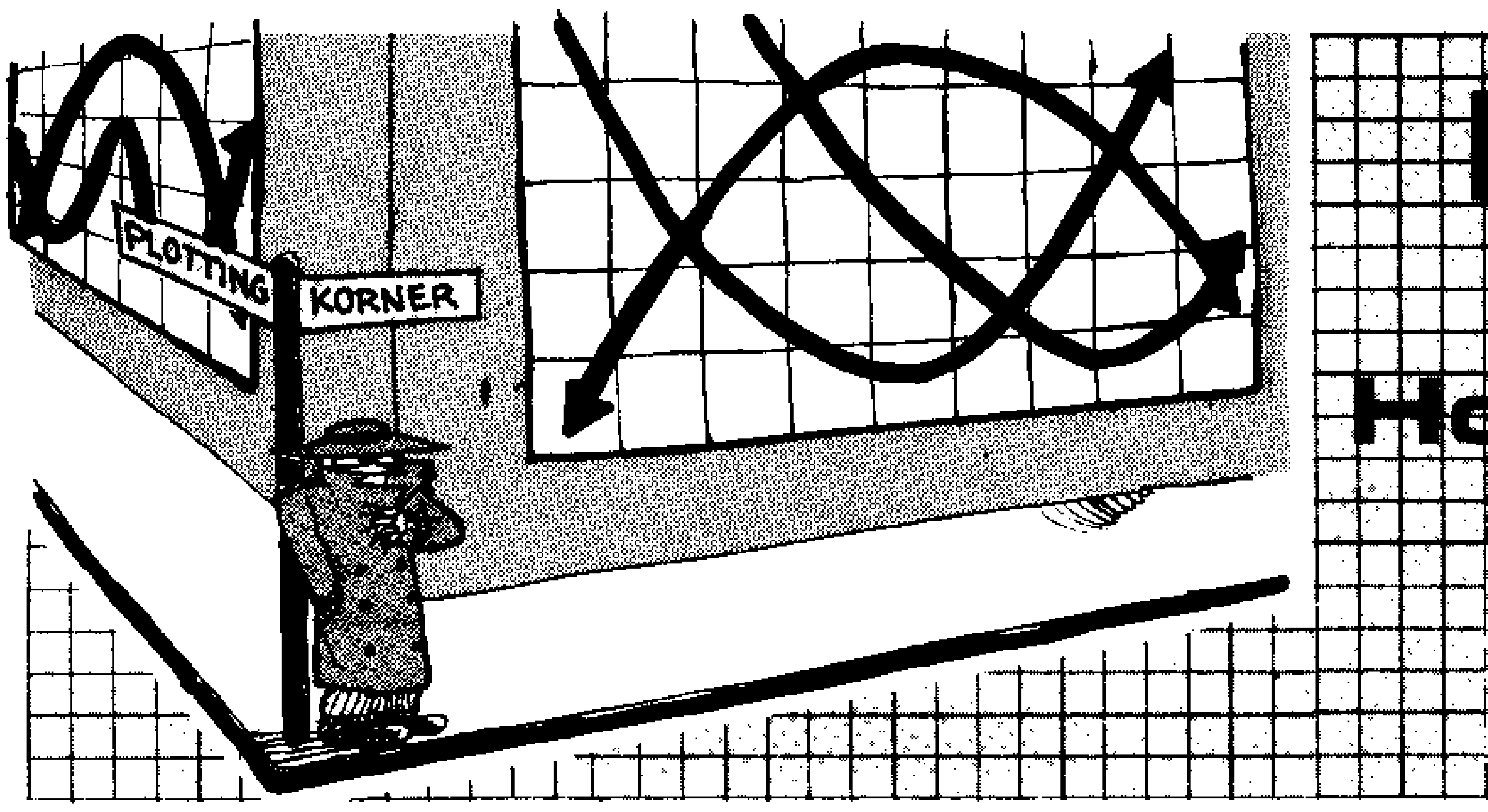

Plotting With The Home Computer

By Joseph G. DeVincentis, Jr.
P. O. Box 375
University of Dallas
Irving, TX 75061

The Assembly Language routines presented in this article will let Home Computer users draw axes, plot curves, and even draw objects in perspective. The software, consisting of plotting routines for the Mini Memory Cartridge, accesses the powerful graphics capabilities of the TI-99/4A through TI BASIC.

The routines supplied in this package require either of the following peripheral configurations:

1. Memory Expansion, cassette recorder, Mini-Memory, and assembled (object file) routines available on this issue's "99'er Magazine-On-Tape." [See page 69]
2. Memory Expansion, disk system, Mini-Memory, Editor/Assembler, and source files (hand entered from listings included with this article.)

Note: The large size of these subroutines, and the fact that part of Mini-Memory is required for the Line-by-Line Assembler, dictates that the *source* files be assembled via the Editor/Assembler rather than the Line-by-Line Assembler that comes with the Mini-Memory. We are therefore making the *object* file available on tape so that readers without an Editor/Assembler and disk system can take advantage of this powerful software—Ed.

Theory of Operation

The routines work on the basis of a plotter. The screen is the plotter's surface, and the routines control an imaginary "pen." The pen can be moved with or without drawing a line on the screen, and if it tries to draw off the screen, it will change no data other than the position of the pen.

The graphic capabilities are unique to the Video Display Processor (VDP) in the 99/4A. However, if the VDP in a 99/4 is changed from a TMS9918 to a TMS9918A (the chip in a 99/4A), these routines are also usable with the 99/4. The TMS9918 and TMS9918A are pin compatible and any software designed for the 99/4 will run with the new chip in place, with no modifications. [This chip swapping should only be done by a competent technician—Ed.]

The resolution of the screen is 192 pixels (dots) vertically and 256 horizontally. The routines allow you to clear the screen, *scale* the screen, draw X and Y axes, output text, change the pen's position and draw lines. Because the routines take advantage of the advanced *graphics mode* of the TMS9918A Video Display Processor (VDP), compromises had to be made (due to memory requirements in this mode).

The VDP takes up 12K bytes of space in VDP RAM to define the shape and color of the characters. This leaves very little room for BASIC programs. Therefore, a buffer was created in the Memory Expansion to keep the character shape table. Because this buffer is *not* in the VDP RAM, the plot cannot be seen until the GRAPH command is issued. Also, once this command is issued, the BASIC program will be destroyed. Therefore, it is advisable to *save your BASIC programs before running them!*

As a positive side effect, after the plot is put on the screen and the user returns to the power-up screen (by pressing the Q key), the plot will remain unchanged in the Memory Expansion Buffer. The plot will exist as long as the user does not issue the GCLEAR command or turn off power to the console or the Memory Expansion. Therefore, it is possible to add data to a plot even after looking at it several times.

The line-drawing algorithm is based on Bresenham's algorithm described in *Principles of Interactive Graphics* by William M. Newman and Robert F. Sproull (McGraw-Hill Book Company). The algorithm was originally designed for control of a digital plotter but is easily adapted to the type of display used on the 99/4A. For a complete discussion of this algorithm, refer to pages 25 and 26 of the book mentioned.

Within the line-drawing routine of the package, A and DELTAA refer to the axis of greatest movement. X and Y keep track of the pen's current position and can only be changed by using the DRAW and MOVE commands. Bresenham's algorithm covers the remainder of the DRAW routine.

Descriptions of Plotting Routines

The routines may be used either as program statements or as interactive commands (hereafter, the term *command* will refer to the statement as either a program statement or an interactive command).

GCLEAR

This routine initializes the graphics package. The *plotter surface* is cleared and the *pen* is set for the lower left-most pixel. The scale is set such that the X axis has a minimum value of zero and the maximum value is 255. The Y axis has a minimum value of zero and the maximum of 191. The lower left hand pixel has the coordinate value of (0,0). The TI BASIC syntax is:

CALL LINK("GCLEAR")

There are no parameters passed with this command.

SCALE

The SCALE command lets you set the minimum and maximum values of the screen. These values can be real or integer. They may be passed as either numeric expressions or as numeric variables. The minimum *must* be less than the maximum, otherwise, a *BAD ARGUMENT IN . . . type error will be issued. The TI BASIC syntax is:

CALL LINK("SCALE",Xmin,Xmax,Ymin,Ymax)

The variables may *not* be passed through numeric arrays. The routines do not support arrays at this time. The scaling of the screen may be changed at any time without affecting the data which is already in the screen buffer. When the SCALE command is used, the absolute position of the pen on the screen is not changed. For example, if the pen were in the lower left hand corner of the screen and the scaling were changed, the position of the pen

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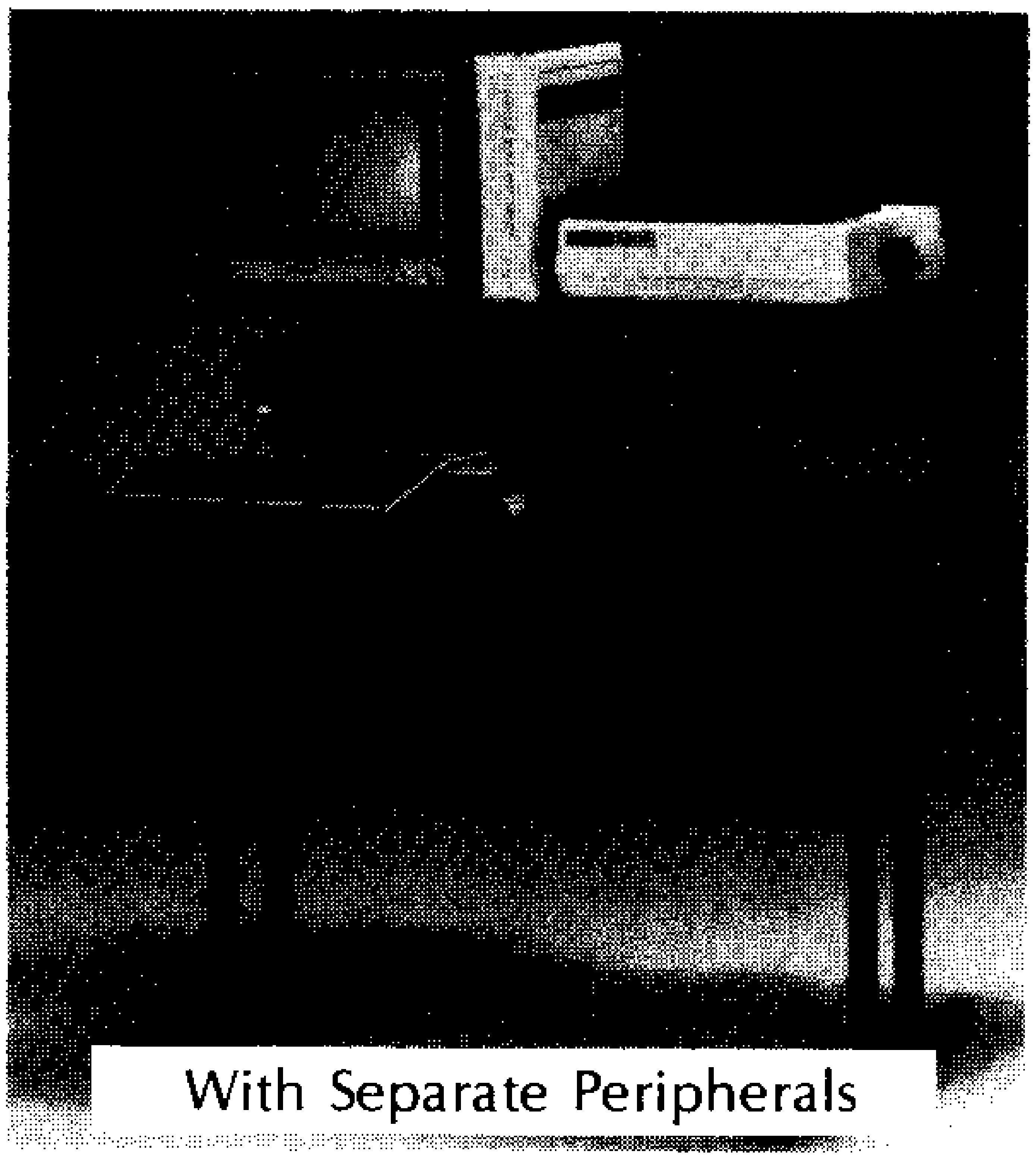

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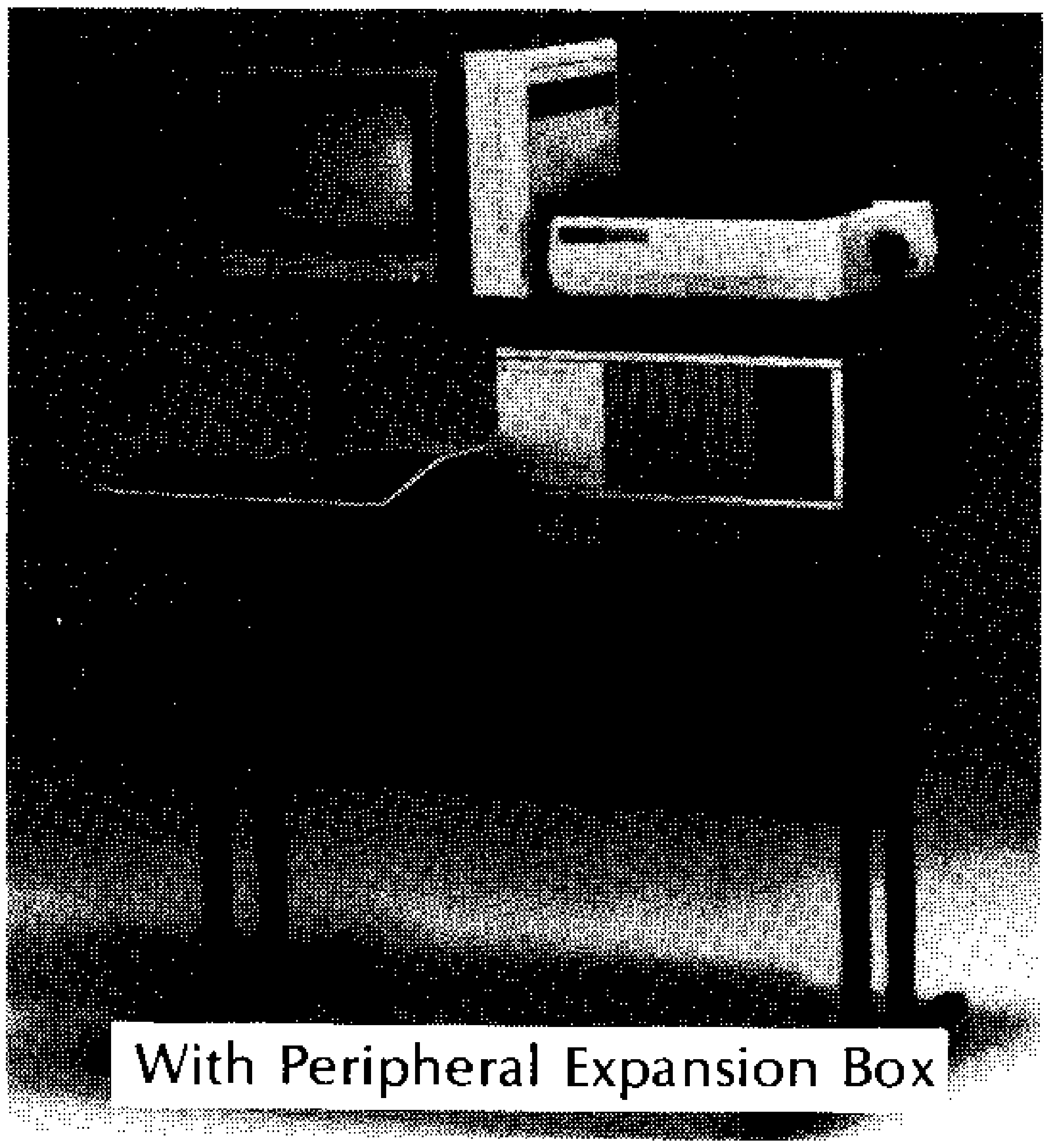

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would *still* be in the lower left-hand corner, no matter what the new scaling.

DRAW

The DRAW command will move the pen from its current location to another point, specified by the user. Since the routine keeps track of the current pen position, all that is necessary is to specify the point to which the pen is to DRAW. The DRAW command is used as follows:

```
CALL LINK("DRAW",Xposition,Yposition)
```

The restrictions and freedoms of the parameters for this command are the same as those for the SCALE command. The X and Y positions are the coordinate values of the destination point for the pen. If the position specified is off the screen, the pen will move off the screen, but will only draw the line to the edge of the screen. Although there is no risk of destroying data by drawing off the screen, there are dangers of numeric overflow.

MOVE

This routine performs the same function as the DRAW command, except that the pen is "lifted" before being moved and therefore draws no line. The pen is put back down after reaching its new location. The TI BASIC syntax is:

```
CALL LINK("MOVE",Xposition,Yposition)
```

The parameters are the same as the DRAW command.

XAXIS

This command draws a horizontal axis specified by a minimum and maximum along the X axis. The axis will intersect the Y axis at a user specified point. The position of the pen will remain unchanged. Use of this command is as follows:

```
CALL LINK("XAXIS",Xmin,Xmax,Yintercept)
```

The parameters may be either numeric expressions or variables. Again, array elements are not allowed.

YAXIS

This command is the Y axis counterpart to the XAXIS command. The TI BASIC syntax is:

```
CALL LINK("YAXIS",Ymin,Ymax,Xintercept)
```

LABEL

This command allows the user to output text to the screen, and is capable of outputting the ASCII characters, including upper and lower case. All characters with an ASCII value of less than 32 will be made to look like a 32 (space). All characters with a value greater than 127 will be equated to 127. In this case, this is also a space. Due to the nature of character definitions, the characters will be output to the character blocks, starting at the block designated by the current position of the pen. If the string is contained in a string variable (arrays are not allowed), the TI BASIC syntax is as follows:

```
CALL LINK("LABEL",variable)
```

If the user wishes to output the string directly, the TI BASIC syntax is:

```
CALL LINK("LABEL","string")
```

GRAPH

This command is used to bring the plots to the screen. The use of GRAPH destroys any BASIC program in memory—so *save your BASIC program before running it*. After the command is invoked, the plot generated will appear on the screen. You can leave this mode by pressing the 'Q' key. The power up screen will appear. If the machine is not turned off, you may add to your graph by returning to TI BASIC and running a new program. The TI BASIC syntax is as follows:

```
CALL LINK("GRAPH")
```

This routine requires no parameters.

Loading the Plotting Routines into Mini-Memory

Once the routine has been loaded into the Mini-Memory, it is not necessary to reload it unless the routine has been destroyed

Continued on p. 60

TEXAS INSTRUMENTS

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Letters . . . from p. 7

Dear Sir:

In talking to people about the TI-99/4A, the conversation usually turns to the machine's speed. According to the 9900 Family Systems Design and Data Book, the 9900 CPU has a speed of 3.3MHz (page 2-12). Some people believe TI is not as fast as some of the other micros on the market. Let's look at the following piece of code:

```
 10 BO = 27200.00
 20 FI = .0066666667
 30 PYMT = 209.93
 40 NK = 299
 50 FOR JS = 1 TO NK
 60 PII = BO*FI
 70 PPR = PYMT - INT(PII*100. + .501)/100.
 80 BO = BO - PPR
 90 NEXT JS
100 PRINT BO;PPR;PII
```

On the 99/4A, it takes about 20 seconds to run. A friend has an APPLE with the Z80 processor installed along with Microsoft BASIC. Using the APPLE BASIC, execution time was about 10 seconds. With Microsoft BASIC, this time lowered to 8 seconds. In doing further research, it was discovered that the 8 bit processors use 8 digit precision. For a different kind of test, a double precision feature was turned on in Microsoft BASIC. This increased the accuracy to 15 digits. The code was again executed, this time taking 32 seconds to complete. TI's precision is fixed at 13 digits. This gives a reasonable explanation for TI's "slowness." One other item was noticed: during one of the tests, a constant was entered incorrectly. This created an overflow condition on the APPLE but the TI chugged on and finally came up with an answer printed in exponential format! For speed, accuracy and flexibility, TI is number one.

Joseph W. Kalinski
Buffalo, NY

Interesting data, Joseph, on TI BASIC. It might be interesting to compare the TI Assembly Language version to the APPLE Assembly Language version . . .

Dear Sir:

I just finished entering the program "Pre-School Block Letters and Data Compaction" by Howard G. Drake (Vol. 1, No. 6, p. 73) into my TI-99/4A. The program is very useful in illustrating data crunching procedures and its "humanistic" graphics execution should be of value to pre-readers (I intend to add this program to the curriculum for the 4 and 5 year-olds at a parent coop school here in Davis).

I congratulate the 99'er Magazine for overall excellence and especially for its commitment to educational enrichment of the traditional curriculum of our schools.

Ratchford Higgins
Davis, CA

We plan to have more programs and reviews of the CAI type, Mr. Higgins. As you are aware, the TI Home Computer can be a great tool for education.

Dear Sir:

I decided to write a short note of compliment about your magazine before I go back to reading my first issue (Vol. 1, No. 6). It's great to have a magazine that deals only with the TI-99/4A and does not bother with those other "computers."

I especially liked "The Beginner's Guide to Cassette Operation with the Home Computer." Since I've only had my 99/4A since March, I am still a novice programmer. This article cleared up some questions I had on use of a recorder and use of files.

Peter Donovan
Dayton, OH

Thanks, Peter, I hope you continue to find *99'er Magazine* the most useful TI Home Computer "peripheral."

Dear Sir:

I've recently become a TI-99/4A owner and a subscriber to your terrific magazine. Your magazine is like an oasis in the desert for me. The evolution from first issue to current issue has been terrific. I think you're putting out not just the best TI magazine, but the best hobbyist microcomputer magazine. I would like to see more articles evaluating hardware (both TI and TI compatible), especially disk systems and printers, and more articles on programming tricks and design. But so far my only serious complaint is that 99'er doesn't come often enough.

Mark Magner
Mississauga, Ontario, Canada

Our going monthly should take care of your "only serious complaint." We plan to increase our reviews of both hardware and software, Mark.

Dear Sir:

I thoroughly enjoyed your article "*Notes on a Computer Score: Part 2 the TI-99/4 Assists Gifted Children in the Learning Process.*" It gives me a feeling of satisfaction to see that kids are excited about learning through the use of computers.

Our family got a TI-99/4A for Christmas last year. I love the "*Music Maker*" Command Module. Being a pianist, I like to experiment with musical patterns and harmonies. I can compose music easily, without having the mind of Mozart. My piano teacher found the TI concept for teaching, a great asset. " . . . It makes learning fun."

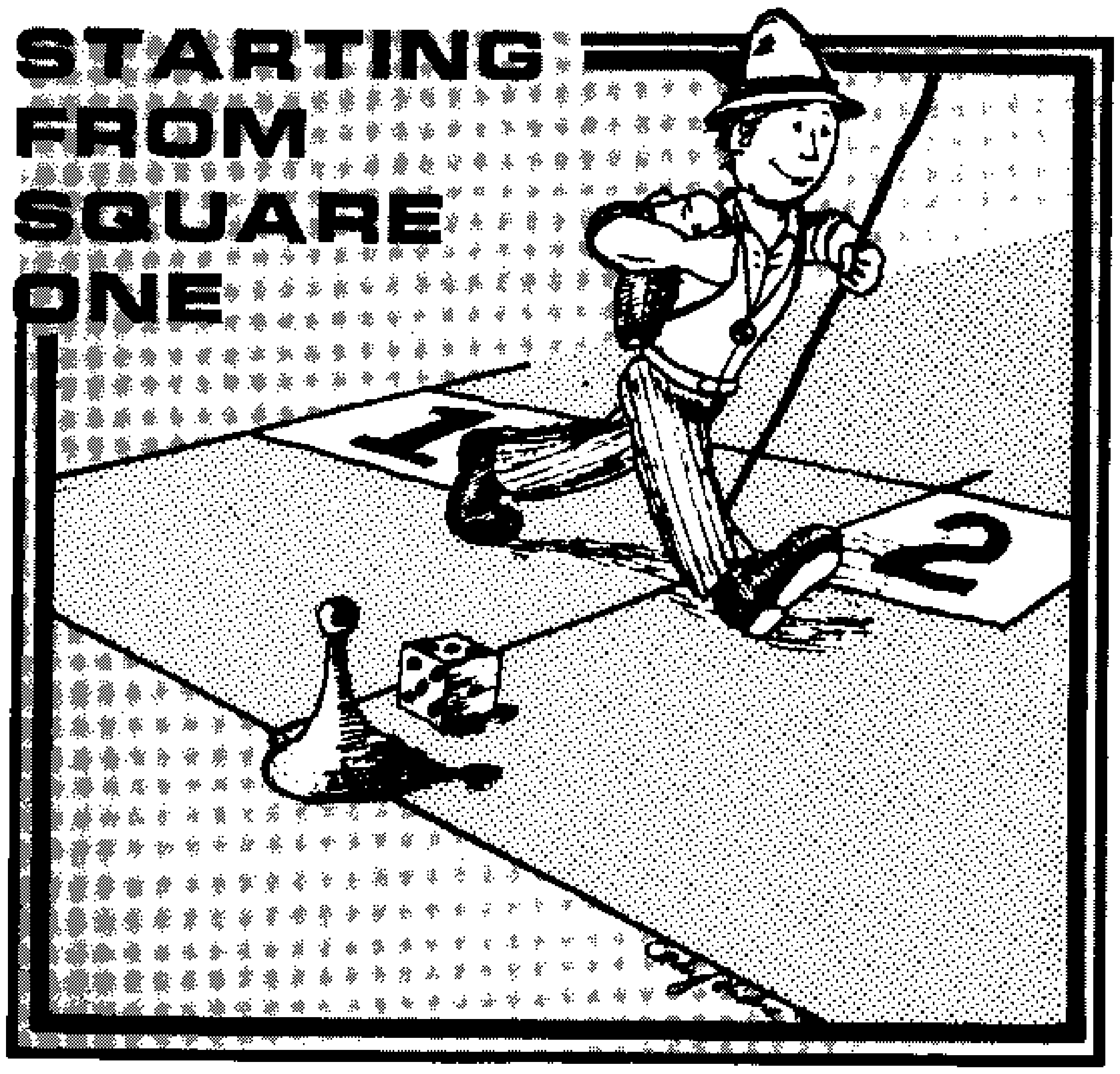
I wish a computer music class could be available in every school as part of the regular curriculum. It would motivate high school students to learn the basics in computing.

I, personally, am considering pursuing a career in Computer Science.

Being relatively new to computers and anxious to understand new concepts—I find the *99'er Magazine* a real help. Thanks for the great job.

Natalie Adams
Chesterland, OH

Natalie, you have made an intersting observation one that many might not immediately comprehend. With CAI, students learn not only the target subject matter, but also the basics of computing. And so, our society advances into the new era.



Oh No! MEMORY FULL

By Regena

3
2
1
MEMORY FULL
TI99/4A
LAREDO

Suddenly, I was surrounded by sleepy-eyed household members asking what had happened. Forced back to the reality of my surroundings, I realized I had loudly proclaimed my frustration at the message on the screen. The clock showed midnight. Yielding to the needs of others—not to mention my own fatigue—off to bed I went. As I lay there, visions of memory conservation danced in my head. . .

One of the big challenges of writing programs is to stay within the memory capacity of the computer: A large program may not run with the disk controller or other peripherals connected. You'll recognize this situation if while RUNing a program, you hear a horrible "BEEP" and see the MEMORY FULL IN . . . message. The following programming hints will help you to conserve memory.

REMark statements

REMark statements are valuable while you are developing your program; they keep track of what each section is doing. REMs are also great for others who read your program listing. However, each REM takes up valuable memory—one byte per character plus each digit of the line number. Deleting REMs is the easiest and perhaps first step to reduce the program size.

By the way, when you write a program, avoid GOTO and GOSUB to a REM. Then if you must delete a REM, you won't need to search for all the places where that line number is referenced.

DIMension wisely

Remember that subscripts start with zero unless you use OPTION BASE 1 . If you do not use a DIMension statement, TI BASIC automatically reserves eleven elements in each dimension, for example A(10,10,10). If you are using up to A(9, 9, 9) or A(10, 10, 10), it isn't necessary to use:

```
100   DIM A(10, 10, 10)
```

which takes up 20 bytes. However, if you are running close to full memory and only need A(6), then use:

```
100   DIM A(6)
```

For higher numbers only, DIMension to the subscript you need. For example, if you have a program for a class of 32 students, use:

```
100   DIM S(31)
```

rather than arbitrarily using:

```
100   DIM S(40)
```

When you RUN the program—even if you don't fill those extra elements—you reserve eight bytes per subscript. Strings don't reserve as much—the element is null until actually filled. Your DIM of a string, when RUN, uses 8 bytes plus 2 times each subscript.

Stack Several PRINT Statements

Remember, each separate line number uses more memory. By using colons and spaces, you may print several lines using only one PRINT statement. The colon means "Go to the next screen line," and you may have as many colons as you need.

Keep in mind that a screen line has 28 positions, and you may use spaces appropriately (in quotations) to print several screen lines. The maximum length of a statement is 112 characters including the line number. Examples are:

113 bytes:

```
300   PRINT
310   PRINT
320   PRINT "THIS STATEMENT
      SHOWS AN"
330   PRINT "EXAMPLE OF HOW TO
      COMBINE"
340   PRINT "SEVERAL LINES OF
      PRINT."
```

87 bytes:

```
300   PRINT : :"THIS STATEMENT
      SHOWS AN":"EXAMPLE OF
      HOW TO COMBINE SEVERAL
      LINES OF PRINT."
```

GOSUB

Check through your listing and note any repetitious code or sequences of similar statements. Consider using a subroutine and GOSUB for commonly used program segments. For example, if throughout the program you use the pressing of ENTER to continue after instructions, you may use this subroutine:

```
200   PRINT "PRESS ENTER TO
      CONTINUE"
210   CALL KEY(O,K,S)
220   IF K< >13 THEN 210
230   RETURN
```

Each place you need this procedure, use GOSUB 200.

You may have a longer procedure with a few variables needing definition before calling the subroutine . For instance, suppose you are drawing two wheels on a car and a man's head—all circles. Specify the necessary coordinates (only those changed since the last use) then GOSUB (300 in this example) to the subroutine that draws the circle:

```
300   REM Circle Subroutine
        :
400   RETURN
500   X=20
510   Y=5
520   GOSUB 300
530   Y=12
540   GOSUB 300
550   X=4
560   Y=20
570   GOSUB 300
```

Limit Variables

Ordinarily you will want to give your variables meaningful names. If memory is a problem, you may have to give up clarity to get your program to run. Longer names take up more memory.

For each independent loop counter, you may use the same variable name. Rather than using FOR MON=1 TO 12, FOR NAME=1 TO 32, FOR COUNT=1 TO 5, FOR DELAY=1 TO 500—use *one* short name: FOR I=1 TO 12, FOR I=1 TO 32, etc.

Use DATA and READ Statements

If you have more than eight statements in a row that are doing the same process, you may use a DATA routine instead, making the DATA statements as long as possible. I say eight because depending on the data, it takes seven or eight statements for the DATA routine. For an illustration here, the usual way to define graphics characters is:

```
400   CALL CHAR(100,"FFFFE7C3C3
      E7FFFF")
410   CALL CHAR(101,"F8F8")
420   CALL CHAR(102,"FF00FF") etc.
```

If you have a large number of characters to define, the procedure can be changed to:

```
400   RESTORE 450
410   FOR I=1 TO 10
420   READ C,C$
430   CALL CHAR(C,C$)
440   NEXT I
450   DATA 100,FFFFE7C3C3E7FFFF,
      101,F8F8,102,FF00FF, etc.
```

To conserve even more, if the character numbers are in consecutive order, use the loop counter instead of READing C. For example, CALL CHAR(99+I,C$). Note also that a string variable in a DATA statement does not need quotation marks unless you want leading or trailing spaces. Deleting quotation marks does not decrease the memory, but it does reduce space, so you may fit more on a DATA statement line.

You may use DATA for CALL SOUND statements (READ in any of the parameters that change with each statement), CALL HCHAR, CALL VCHAR (READ x-coordinate, y-coordinate, character number, and repetitions) or with any statements that use numbers or strings that can be READ from DATA A disadvantage of using DATA statements is that it is harder to figure out what a program is doing.

Remember to take advantage of TI's RESTORE, which allows the DATA statements (which may be placed anywhere) to be selected, read and re-read.

"Scrunch" DATA

Perhaps the best way to explain this is with an example. Suppose you have a football statistics program. One DATA statement includes the player's name and the number of pass interceptions per game for ten games. A dash means he did not play, and an asterisk indicates he was injured. The program segment is:

```
200   READ LAST$, FIRST$
210   FOR I=1 TO 10
220   READ P1$
        :
260   NEXT I
```

with the accompanying DATA for one player:

```
300   DATA DOE,JOHN,-,0,1,3,0,0,
      2,3,*,3
```

This DATA statement uses 59 bytes. The bytes may be reduced by leaving out the zeros. This is especially helpful if a DATA statement has a lot of zeros (some of the players intercepted very few passes). Deleting the zero indicates a null string, and the logic in the program would have to include an IF statement to change the

Continued on p. 38

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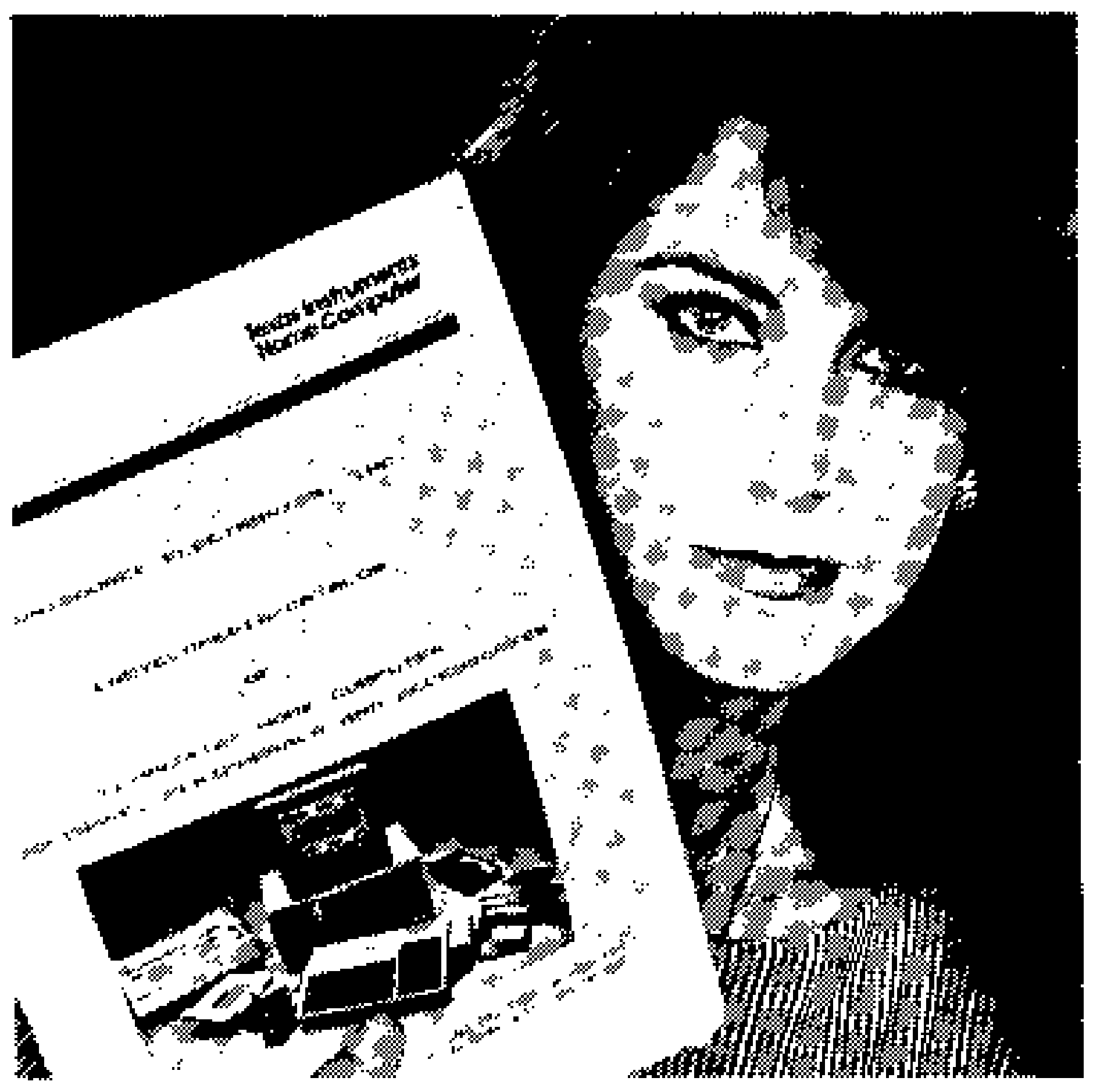

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Excerpts from the

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of news & happenings in the Home Computer world

TI OPTS FOR REBATE EXTENSION

The Digest has just learned that the TI Rebate/Free Speech offer has been extended until April 15, 1983—a marketing move based on the premise that giving away $100 checks and free accessory products is presently the most effective strategy for maintaining TI's lead in retail sales.

GUNS OF NAVARONE FIRE ASSEMBLER TOOL OUT TEXAS WAY

A TI spokesman has just announced the purchase of "Super Bugger" from Navarone Industries of Sunnvale, California. The software consists of an interactive Assembly Language Debugger allowing single-step trace, and advanced program development using a bit-mapped screen, disassembler, and memory dump utility. The product will be disk-based. Future price and availability to be announced. The purchase is significant in that it demonstrates TI support of third-party software development by providing the suitable tools.

MULTIPLAN GETS READY TO SPREAD ITS WINGS

The remaining bug in Microsoft's implementation of Multiplan (a sophisticated spread sheet tool) for the Home Computer has been fixed by the program's authors. The release of the software to TI's Semiconductor Group for chip manufacture—needed for the master Command Cartridge—signifies another marketing coup for TI: As was accomplished with the p-system, the lowest cost hardware/software implementation of a popular micro product has found a strategic place in the Texas stable. Users demanded a "Visicalc," and Lubbock is providing it—only better and cheaper.

MULTI-LEVEL MARKETING IS MUSHROOMING

October's 99'er TI-Fest in San Francisco provided the birthing place for a brand new multi-level marketing plan for the TI Home Computer. Scotch Marketing, Inc. (Springfield, MO) signed up several hundred new dealers at the show. Tronics Sales Corporation, the original multi-level Home Computer distributor, was also represented at the show through the recruiting efforts of another exhibitor, the San Francisco-based Personal Computer Association.

THE TI-CDC PLATO RELATIONSHIP IS NO LONGER ALL GREEK

A series of Control Data Corporation (CDC) ads have recently been promoting their Plato courseware for three popular microcomputers, the TI-99/4A included. Under an agreement with CDC, TI took the "pick of the litter"—the 500+ programs (organized as 108 software packages) in Basic Skills and High School Skills that have the most impact for home and educational institutions. CDC gets to market the rest to TI users directly. The Plato implementation on the TI machine is the most comprehensive set of CAI ever done on a micro. A student who successfully completes the High School Skills courseware is supposed to be able to pass a high school GED test.

TI FORTH TO USHER IN THIRD WAVE OF HOME COMPUTER SOFTWARE

Third-party software producers and serious programmers will get a new development language when TI Forth becomes available for shipping in presumably the late Forth quarter. The language features and applications were demonstrated at the heavily-attended TI-Fest Forth seminar. The TI implementation includes an extra 64-column bit-mapped editor, a provision for HI-RES dot graphics, and simple control of Interrupt Service Routines (ISRs) that govern "simultaneous" processes—a feature that should find use in games, music and applications like print spooling.

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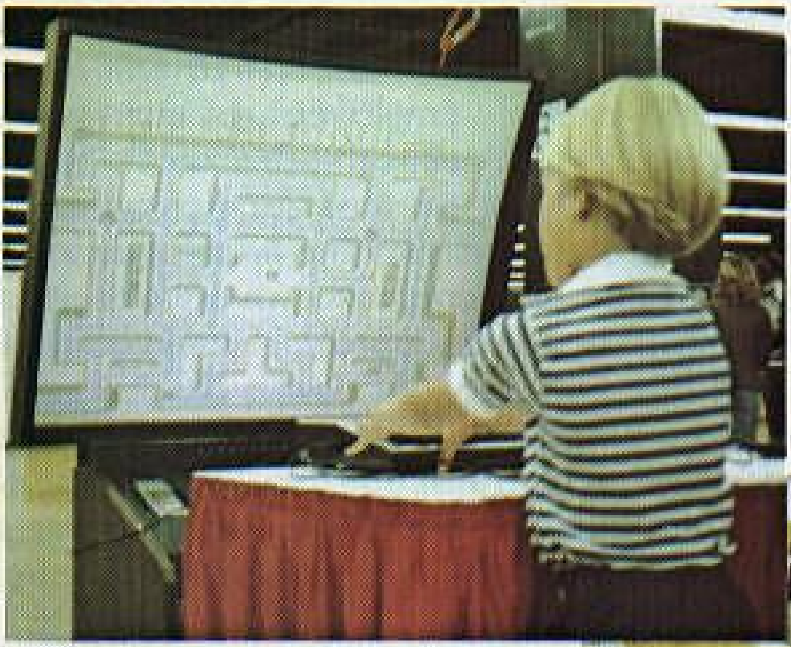
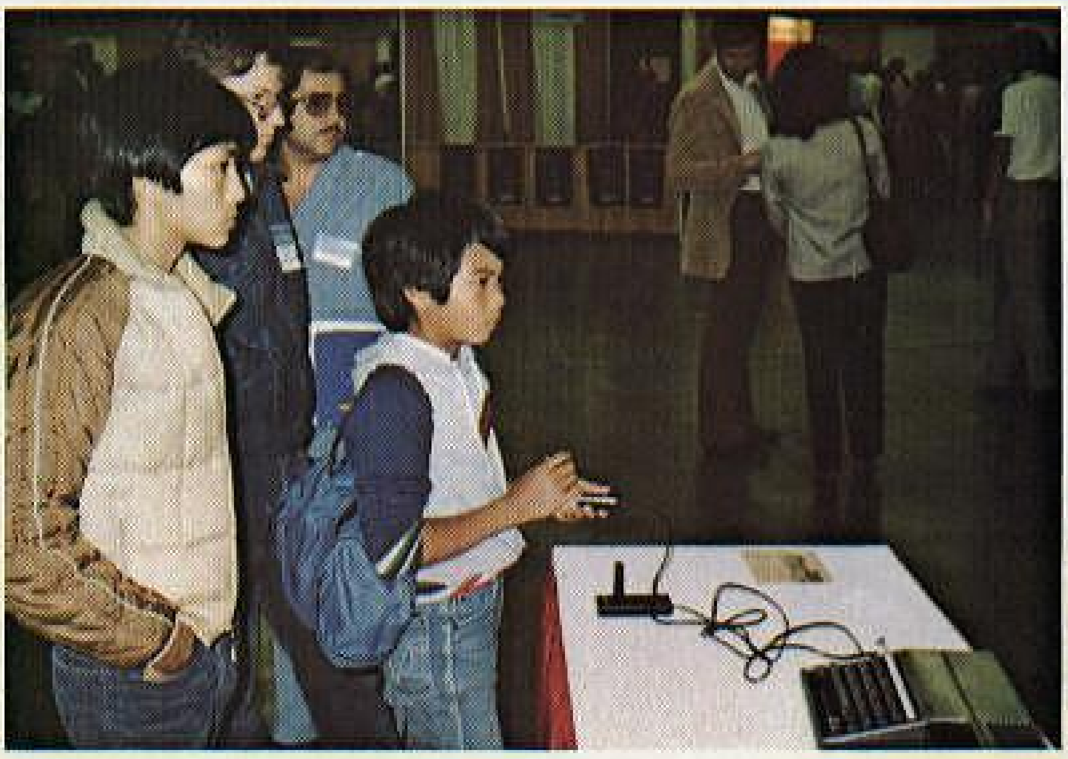
99'er TI-Fest: The Home Computer Show™

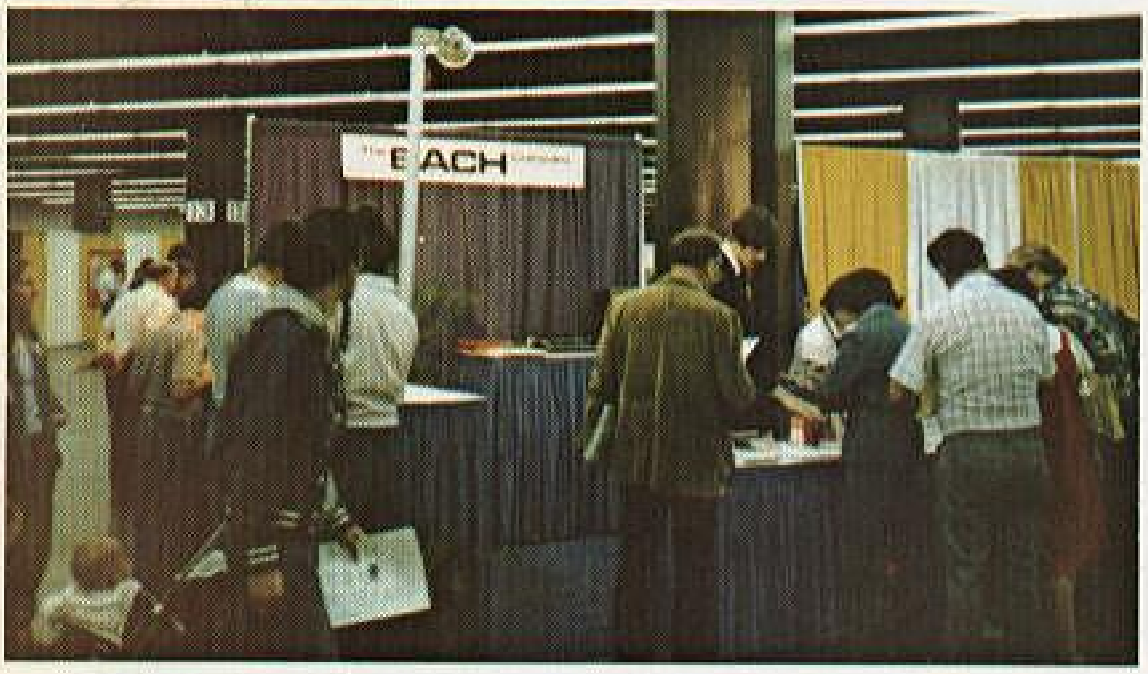


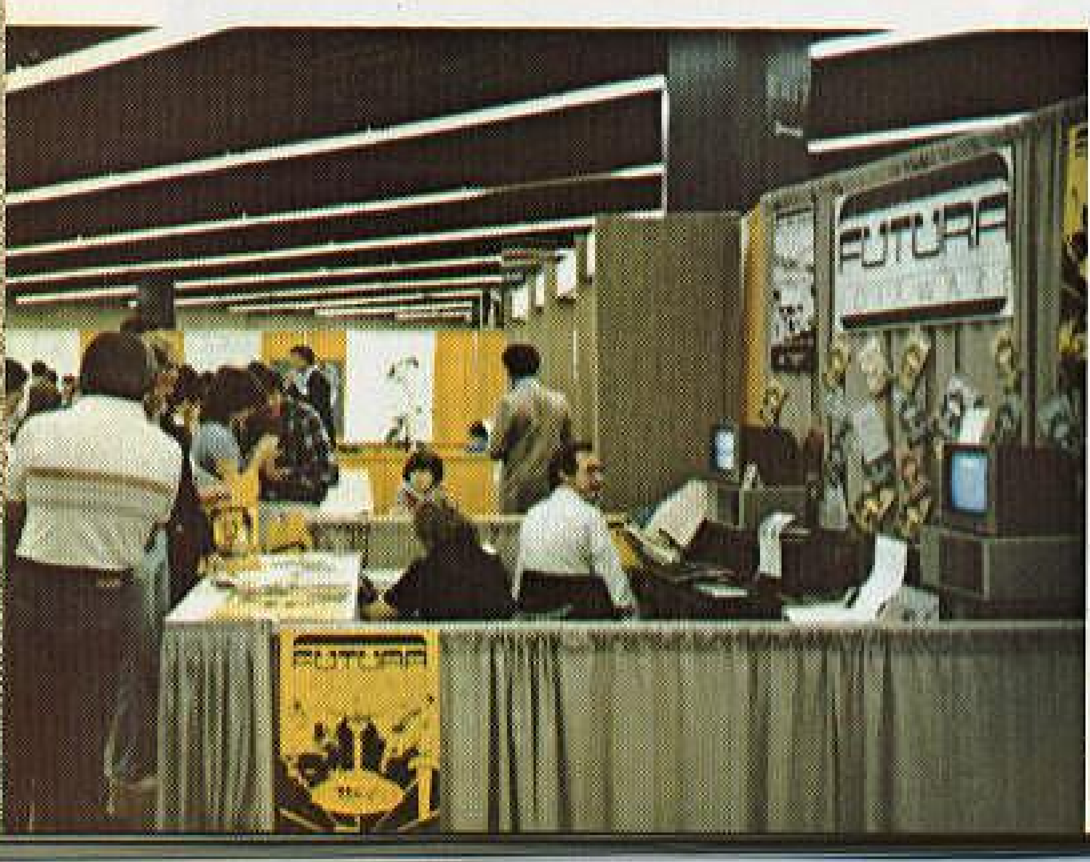
It was an event that will be long remembered among the Texas Instruments Home Computer users, future users, and interested observers who attended. Three fun-filled and informative days (October 22-24) in the City by the Bay. Perfect weather, great food, and a unique hands-on opportunity for the nearly 18,000 showgoers to try all the latest TI hardware, software, and electronic learning aids, plus examine the compatible wares and services from the many innovative third-party vendors who also exhibited. Then there were the seminars—nearly four dozen well-attended sessions that proved to be a learning and enrichment experience without equal for those people who took the time to listen, look, and marvel at some of the



applications and features of the versatile "little $20 machine." Additionally, there was an in-dept LOGO workshop, a chance to talk directly t knowledgeable TI employees and management, th opportunity to meet with other users from all ove the world, and the fun of competing for prizes i some of the most exciting arcade games ever t grace a video screen. Hundreds of door prizes wer also given away during the three-day event.

TI-Fest was truly a *Home* Computer Show– the first of its kind. People of all ages and interest attended. It was *not* the typical hobbyist or bus nessman's show; rather, it was an event that a members of the family could enjoy and learn from





Scotch MARKETING

The unique floor layout and decor, as shown in these photos, emphasized the Disneyland-like separation of interests into Education Land, Computer Gaming Land, and 99-er Land (everything not specifically education or gaming). The nearly 200 Home Computer systems residing on large octagonal islands scattered throughout the 60,000 square feet of exhibit area projected a feeling of user-friendliness and invited hands-on participation. Large-screen projection TVs dotted the floor, and vendor booths provided the natural boundaries between the three island groups.

The nearly 60 hours of well-attended seminars covered a diverse range of subjects including

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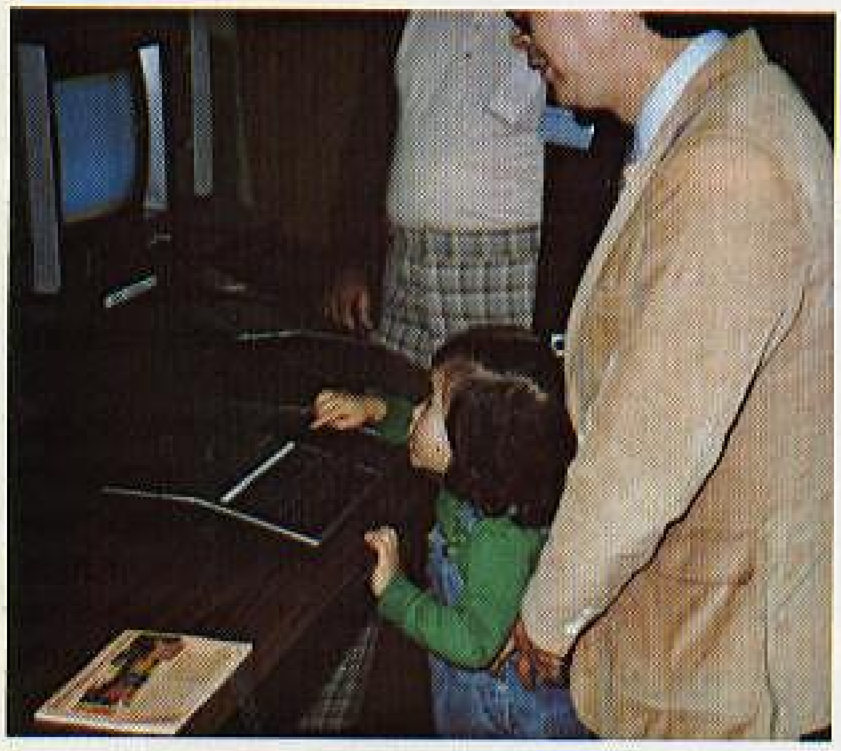
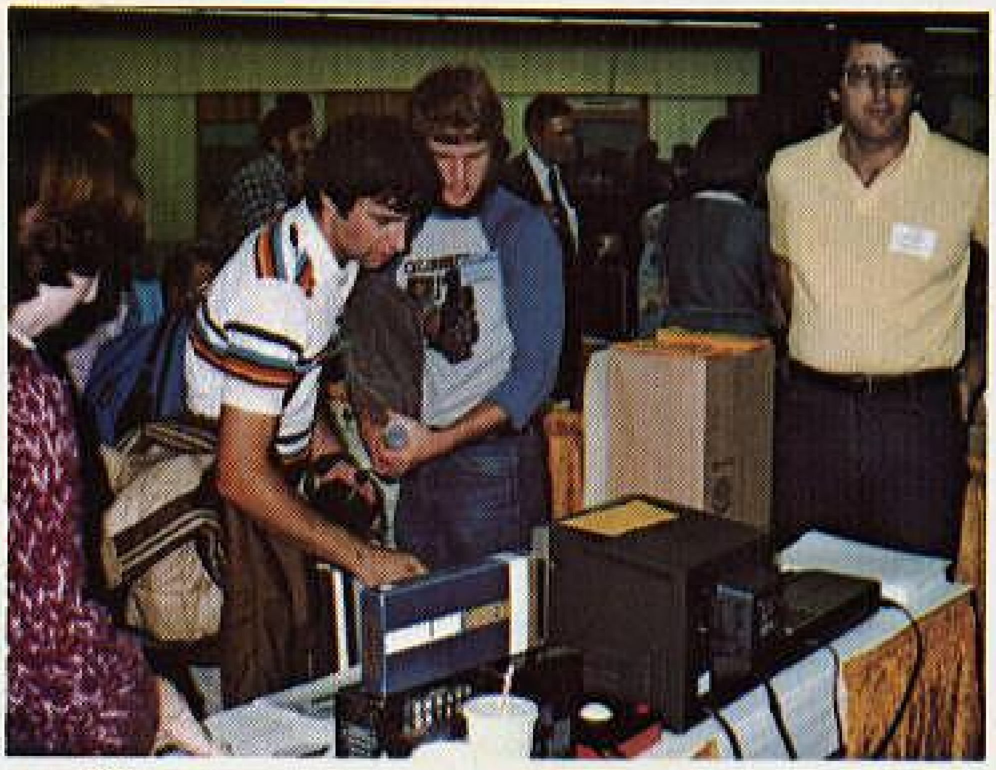
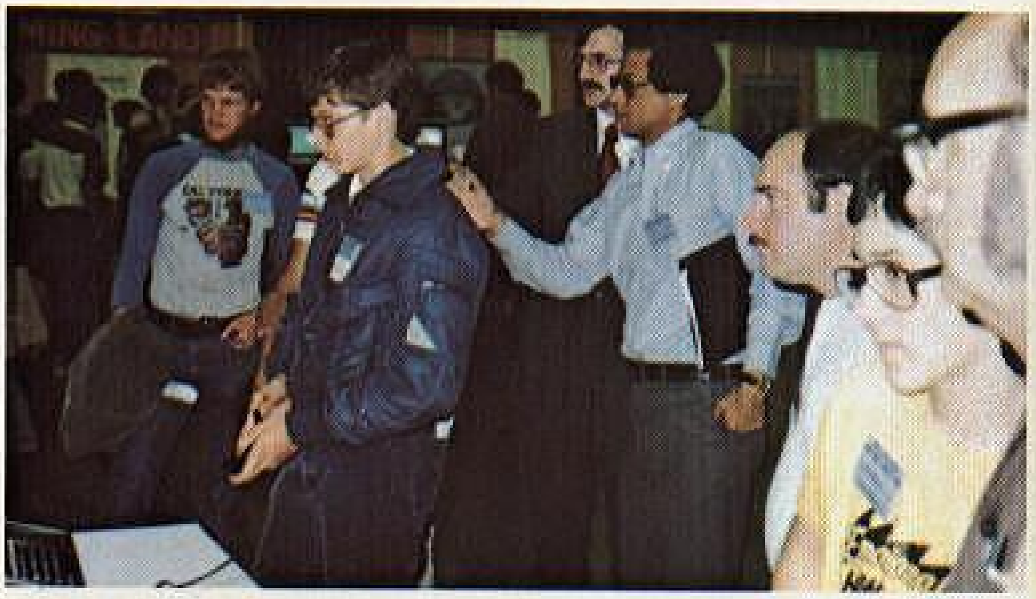


beginning tutorials in six different Home Computer languages, music, interactive video, and computer-assisted instruction for the retarded, as well as game design, commercial software development, word processing, and automated bookkeeping/accounting systems.

The vendors who exhibited at the show were selling a wide ranging collection of wares and services including game, educational, business, and home management software; modems; expansion boxes; joysticks; computer desks and printer stands; courses, posters, and commemorative mugs; double-sided disk drives; books and magazines; multi-level marketing plans and user group memberships; typewriter printers; cassette adapters and dust covers; and even some 16-bit T(I)-shirts.





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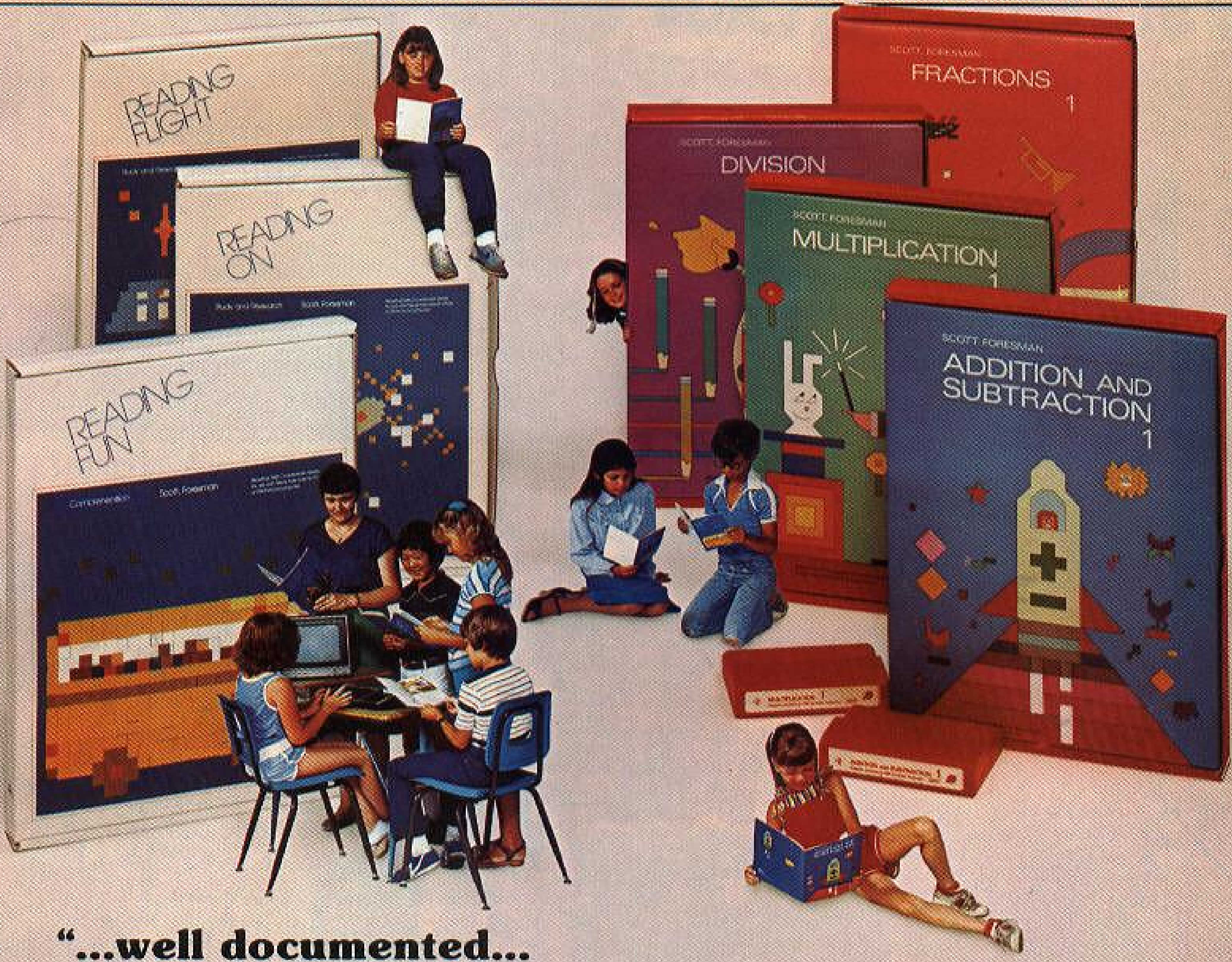
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Introduction

LOGO Times is an information resource for anyone interested in participating in the creation of their own *personal* language – one that will easily allow them to communicate with a computer in a totally new audiovisual realm of applied imagination, exploration, and self-discovery. The articles on these pages concern the use of the new TI LOGO language, but readers, however, do *not* need any additional software or equipment (or even a computer) to understand and learn from the material presented here.

If readers want to actually *experience* a TI LOGO environment, they will need either a TI-99/4 or TI-99/4A computer, the Expansion Memory peripheral, and the TI LOGO Command Module. A disk drive, although convenient to have, is *not* required; a user's work may alternately be saved on cassette tape, printed out on the TI Thermal Printer, or hand copied into a notebook (for later re-keyboarding).

In each issue, one or more of the articles may reference or build upon the topics discussed in a previous article. It is therefore recommended that for maximum benefit and understanding, new readers obtain the appropriate back issues of *99'er Magazine* in which the *LOGO Times* articles are contained.

Notice

LOGO Times is actively soliciting articles. Manuscripts should be typed double-spaced, and accompanied by a cassette tape or disk if containing any lengthy procedures or graphics.

Send all materials to:

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99'er Magazine
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All mail directed to the Letters-to-the Editor column (*Letters on LOGO*) will be published in accordance with the conditions set forth on *99'er Magazine's* Masthead page.

Our Contributing Editors

Henry Gorman, Jr.
Department of Psychology
Austin College
Box 1584
Sherman, TX 75090

Roger B. Kirchner
Department of Mathematics
Carleton College
Northfield, MN 55057

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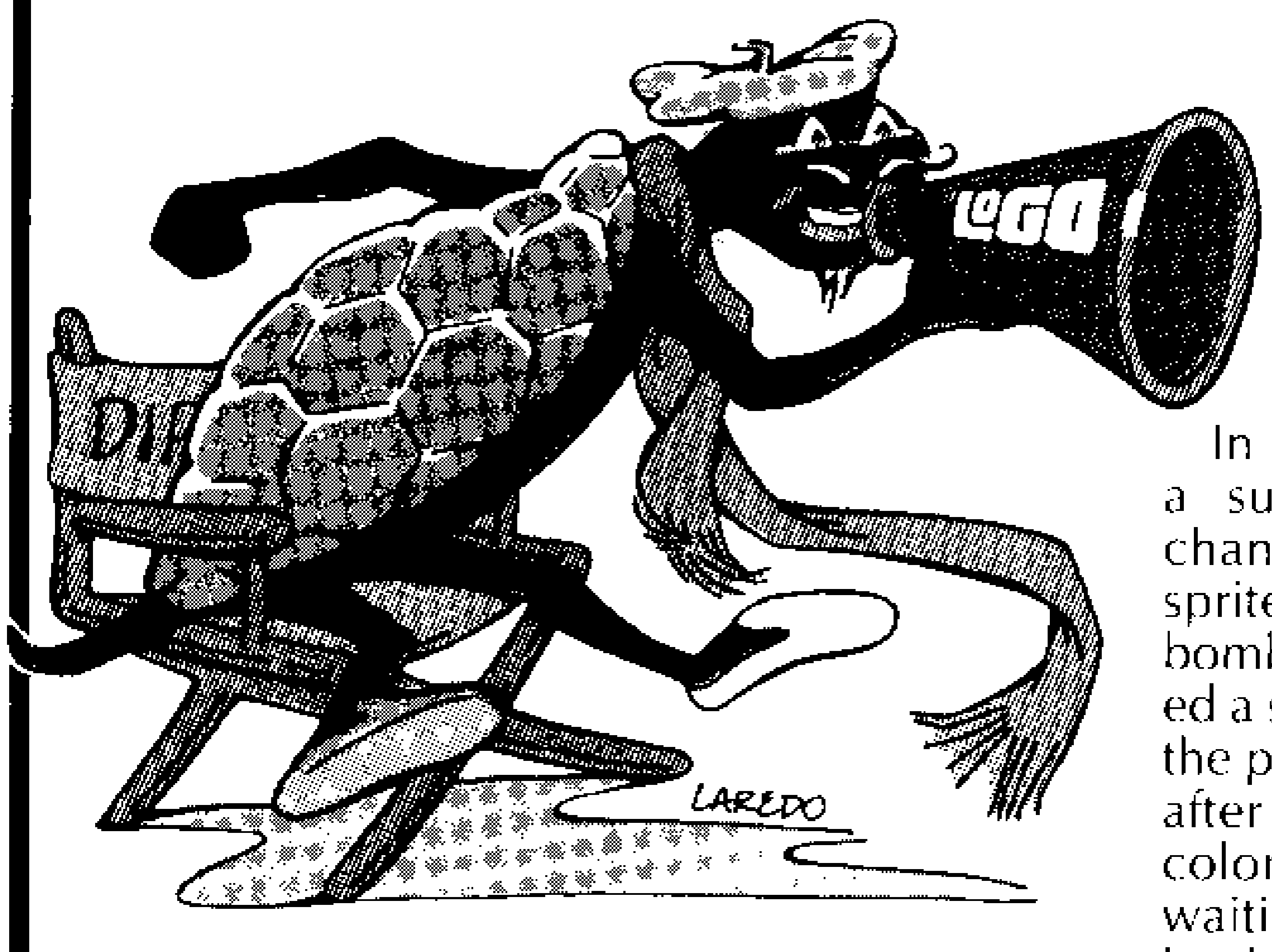

By Henry Gorman
Contributing Editor

Creating computer games in LOGO is simple and straightforward. You can come up with great games and video shows using the LOGO statements you already know, plus a few new simple tricks.

Animation and Animated Stories

The trick to making animated characters in LOGO is to take advantage of the same illusion that has given us the motion picture. If a series of pictures, each slightly different, is flashed before your eyes you see them as continuous movement—what is known as the Phi phenomenon. You can do it with LOGO by making a sprite carry first one shape then a slightly different one—the quick succession of shapes creating movement.

The motion seems continuous if the sprite rapidly alternates shape (such as the flying bird in the TI LOGO manual)or if the sprite carries successively different shapes. For cartoons with repeated motions (a stick figure walking or a Munchman munching) a sprite should alternate between two or three shapes. But remember, the shape numbers and sprite numbers are *not* the same; a sprite carrying shape 6, is not sprite 6. If you are hit with that bug, you end up with funny-looking and very uneconomical animation.

A LOGO Movie

To animate a series of events, just time the appearance of shapes in the positions you desire. For example, one of my younger students (a third grader) wanted to make a "movie" of a plane flying across the screen and dropping a bomb to blow up a bridge.

He let one sprite carry the plane and a second one carry the bomb. Because he made the bomb smaller than the plane, with both sprites moving together (i.e., same XCOR, YCOR, heading, and speed), and because the bomb sprite had a higher number than the plane sprite, the bomb was not visible.

In his movie program, he schedule a suitable waiting period and the changed the heading and speed of th sprite carrying the bomb so that th bomb appeared to fall. Also, he schedu ed a suitable waiting period so that whe the plane reached the edge of the scree after dropping the bomb, the plane wa colored clear. Again he put a suitabl waiting period into his program (whic he determined, by trial-and-error) so tha the bomb reached its target. The bridg was made up of four different shape carried by six sprites. Finally, the bomb sprite and bridge-sprites dropped thos shapes (i.e., bomb and bridge) and carried exploding shrapnel shapes, colore red. His concept was fairly simple although calculating the correct waitin times was difficult.

The right waiting times can change depending on differences between computers and the amount of memor already filled. These bugs can be taken out with coincidence checks, discussed in a later section of this article.

Beware, The Endless Movie

When you want to animate, you have to be careful where you use recursion For example, suppose you wanted a movie combining the tree-seasons program of the TI-LOGO manual with the flying bird program. Of course the sprites used for the trees could not also be used for the bird; neither could you show more than four sprites on a horizontal line. If you structure the programs:

```
TO MOVIE
SETUP
FLY
SEASON
END
```

The computer never finishes FLY because FLY is recursive and does not have a stop rule. And if you put SEASON before FLY, the computer never finishes SEASON because SEASON also is recursive with no stop rule.

If you change FLY and SEASON so that they are not recursive and place them together into a recursive program:

```
TO MOVIE
SETUP
OVER
END

TO OVER
SEASON
FLY
OVER
END
```

Movies & Games in LOGO

Your bird will flap only once with each change of season! Breaking the program into recursive and non-recursive subprograms is often a useful technique, but here it has created a terrible bug. A solution to the bug would be (a) write a non-recursive FLY program, and (b) replace the WAIT commands in SEASON with:

```
REPEAT 50 [FLY]
```

Now, the replacement line serves the twin functions of keeping time between seasons and of causing animation when desired.

PRINT and TYPE

Some computer projects use written instructions, provide feedback (or scores), or require movie captions. These projects all need PRINT and/or TYPE commands. Both commands remove the outermost set of brackets from embedded lists—i.e., PRINT [[HELLO] [THERE]] prints [HELLO] [THERE].

After a PRINT command, the cursor performs a *carriage return* and starts a fresh line; after a TYPE command, the cursor simply remains one space past the last printed character. TYPE commands are preferable for messages using variable answers such as "YOUR SCORE IS 6." The sample message could be printed with TYPE [YOUR SCORE IS] PRINT :SCORE.

To get a space between TYPEd messages or between a TYPEd message and a PRINTed message, you can either write PC 32 between the two commands, or put a space command between them such as:

```
TO SPACE
PC 32
END
```

Interactive Games

Some projects require the user to think of answers, to make selections, or to respond to game plays. There are two ways to accomplish this interaction—through READCHAR (RC) or READLINE (RL). These two operations have some important differences. When READLINE is executed (either in a LOGO program or at command level), it prints a ">" character in lieu of the "?" prompt and waits until the ENTER key is pressed.

Any characters typed before ENTER is pressed become a list (and internally the computer places brackets [ ] around them). Thus "A = READLINE followed by a typed A and ENTER will produce

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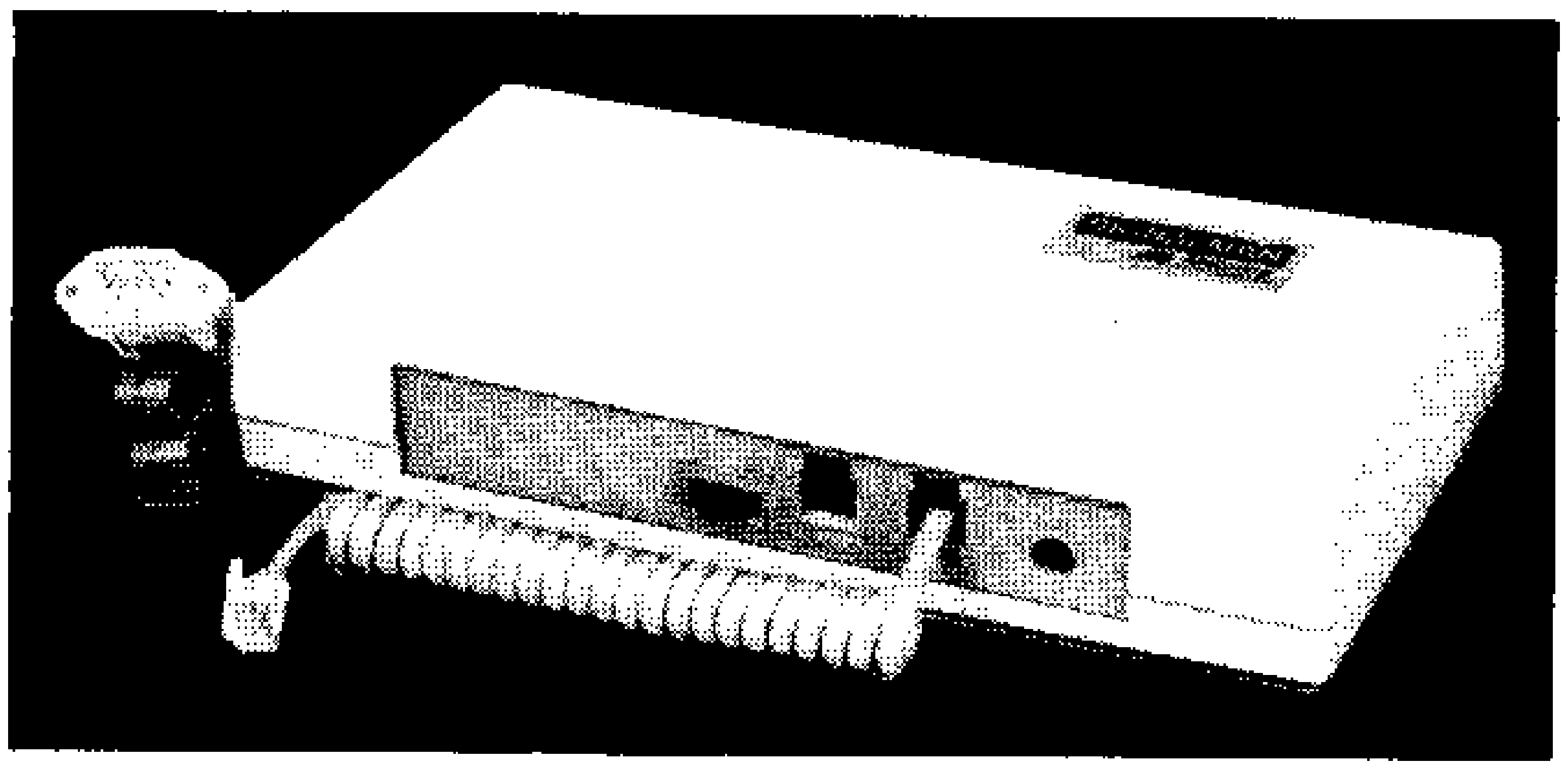

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Turtle Arcade... from p.33

FALSE, but [A] = READLINE under the same circumstances will yield TRUE. The fact that READLINE can take more than one typed character as input (which READCHAR cannot) is especially useful for commands requiring list input (e.g., EACH and RUN).

A major disadvantage of READLINE is that you must press ENTER each time READLINE is used. READCHAR also makes the computer wait for a keyboard response; unlike READLINE there is no special prompt symbol; as soon as a key is typed, that key is input as a word without showing on the monitor.

With both READCHAR and READLINE the input information is lost after it is used once—unless assigned a name as in:

```
CALL READLINE "ANSWER
or
MAKE "ANSWER READLINE
```

An obvious problem can arise with these two commands: When a program executes either command, it does not continue until it receives the appropriate keyboard response. What if the game player wishes *not* to respond? To avoid this, you can use RC?; it outputs TRUE when a key is typed and FALSE otherwise. Put this together with TEST for:

```
TEST RC?
IFT someaction
IFF someotheraction
```

The above code has one potential bug: whenever RC? becomes TRUE, it remains TRUE until the information in RC is assigned a name. To cure the bug use:

```
TEST RC?
IFT CALL, RC ANSWER someaction
IFF someotheraction
```

Watching Where You're Going

When people compose LOGO games, they often stumble onto bugs in the *flow of control*. Flow of control merely denotes the order of lines in a program. Ordinarily, control flows linearly from the first line to the last; it can branch with the use of IF conditionals, (IFT and IFF statements).

The great potential of LOGO as a procedural language admits to some control problems if you do not watch your step. To keep track of the flow of control, I anthropomorphize the computer and think of programs as controlled by "little men" who (a) may run only one program, (b) must stop when they reach END, STOP, or OUTPUT, and (c) literally do what they are told to do. Then I can follow control by sketching in the stick figures and watching when programs are assigned.

Coincidence Checks

Earlier I alluded to problems of time delays in LOGO movies with interacting sprites. In games, you often want some visual effect to occur only when a sprite is at or near some target. For both cases, use LOGO logic to run coincidence checks. In some games these coincidence checks are needed frequently, if only in restricted circumstances.

Because each coincidence check takes time, an economical program would run the checks only when they might be positive and only when a positive matters. For example, in an earlier article I developed a PONG-type game. In the game, the position of the ball relative to a paddle is immaterial when the ball is moving away from the paddle, so the coincidence checks should be performed only when the sprite carrying the ball is heading toward the paddle.

To make coincidence checks less time-consuming, those checks which use both an X and Y position can be divided:

```
TO CHECK
TEST XCOR = :XTARGET
IFT OUTPUT YCHECK
END
TO YCHECK
OUTPUT YCOR = :YTARGET
END
```

With split checks, the order of checking X and Y positions should be arranged so that the least likely coincidence is examined first.

An important consideration in some games is that the sprite of interest in a coincidence check may be moving very fast. Such circumstances hold two im-

Continued on p. 37

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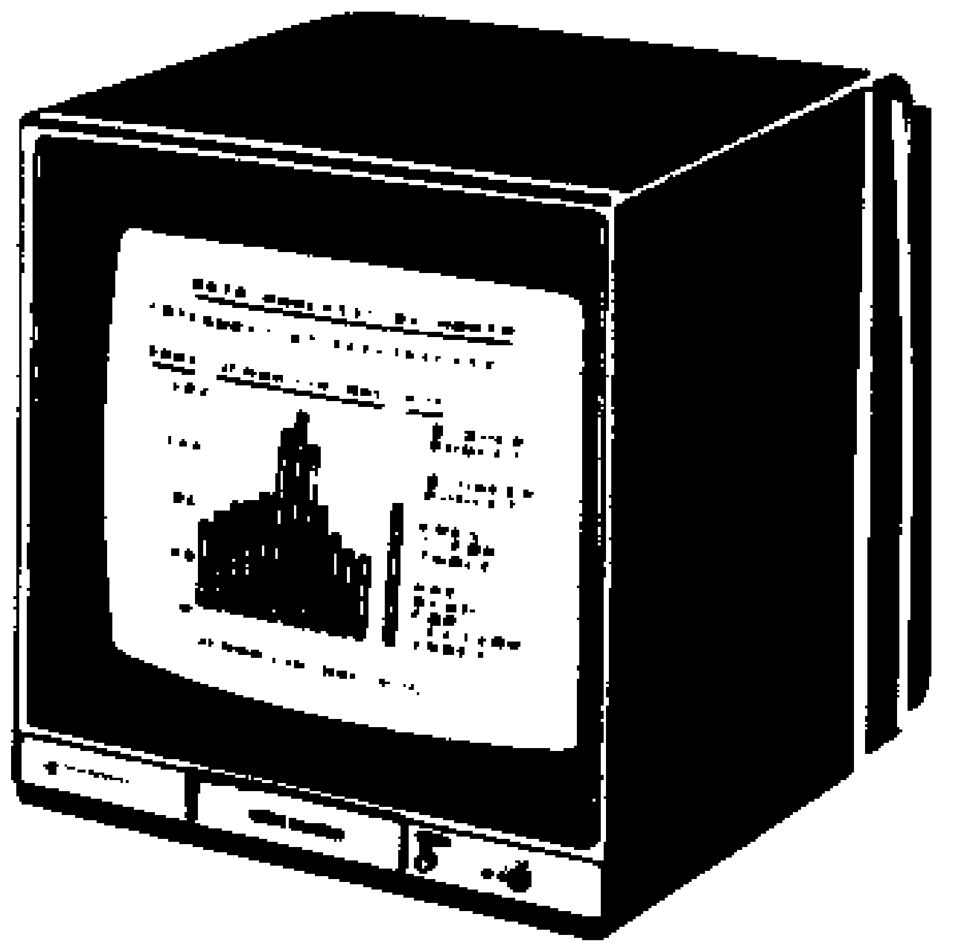

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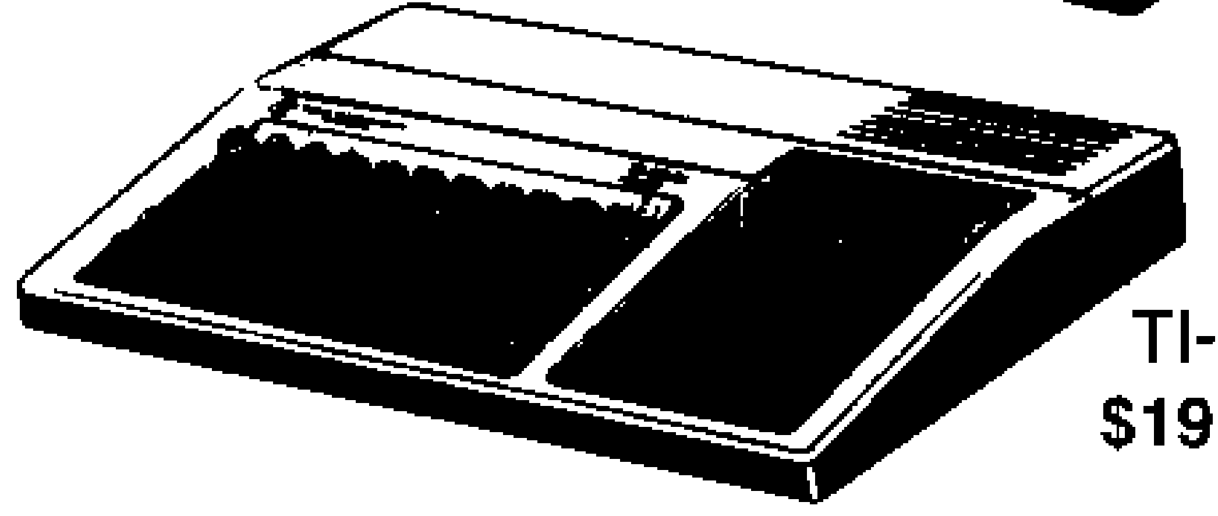

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Mailing List... from p.11

Once you have added a new name, be prepared for a shock. The screen suddenly announces "SORTING." I must confess, it almost gave me apoplexy, having been preconditioned to SORTING on the TI Mailing List program. When the latter used to say SORTING, it meant it—and you couldn't use your computer for the next quarter hour. But don't despair; when this one threatens to sort, it is only a fast, and I mean *fast*, CALL to subprogram SORT in assembly language. In a couple of seconds the attractive boxes are right back, inviting you to enter some more names.

Print Only What You Want

The next option I suggest is SELECT TO PRINT. It will prepare your file for printing by pre-sorting according to any criteria you desire: last name, Zip code, the maiden name of your grandmother (just kidding, Charles)—in short any of the *fields,* as the people in the business would say. Now, this program *must* be done *before* you select the PRINT LABELS/LISTS program. It puts the correct pointers in place, such that you can print your labels or reports in the desired order. Sorting by Zip code, for example, takes a little more time than the usual sorting by last name, because the former is a diskette sort. It sorts at a rate of 32 names per minute, and you are informed of its progress at all times by a convenient message on the screen saying "PROCESSING RECORD #xxxx." By the way, you may have up to 500 names on one diskette with this mailing list program, opposed to 350 in the TI Mailing List.

Now comes the PRINT LABELS/LISTS program. It asks if you want labels or a name list, how many blank lines between labels, the print density, and whether you want all the names at once or if you want them individually displayed for your approval. Print speed will depend on the particular printer you are using and on the Baud rate. For example, using an Epson MX-80 at 9600 Baud, this program will print about 8 labels per minute in any choice from 1 through 4-up.

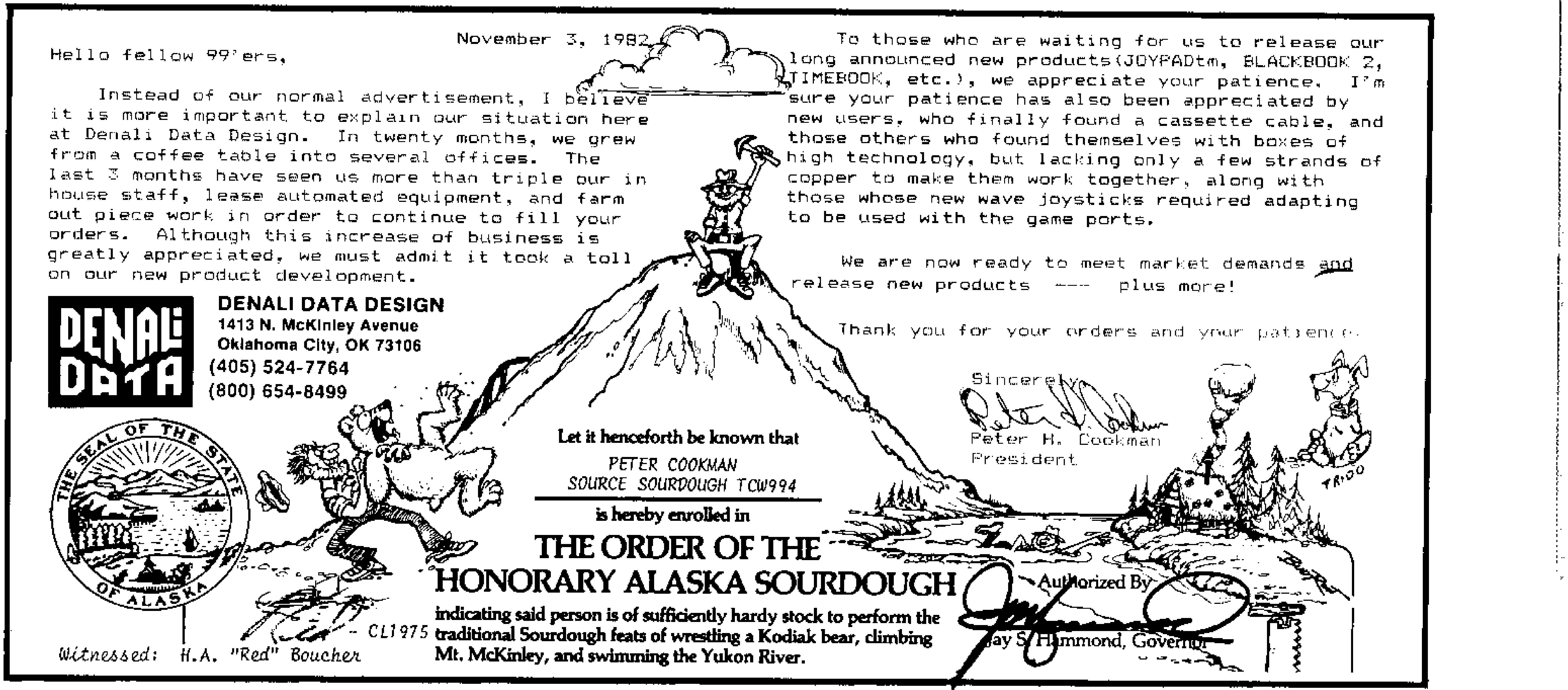
Finding Names You Can't Quite Remember

Another selection is the SEARCH/DISPLAY program. You are allowed to enter a part of a name (remember Zbigniew Morasczewski?) and the program will search for all possible matches. So, in the case of good old Zbiggy, all you have to enter is "Mora" and the program will do the rest. This is particularly handy for me. I am the editor of a TI-59 newsletter, and on any given day, 30 out of 4000 members will call and ask if I can send them a specific copy, article, program, or what have you. I used to ask the caller for a name and address, and I took notes. Then at the end of the day I would spend another hour and a half typing out mailing labels. Not anymore.

I just ask the caller for a name, type the beginning letters of it and, while we are talking, the first match appears on the screen. It usually takes no more than two tries to find the correct name and address. Now the program asks if I want it printed on the MX-80 I keep loaded with mailing labels. At my "Yes," I get a faultless label out of the machine. This feature alone has given me back an hour and a half of much-needed sleep per night. Assuming your computer is loaded already with this program (mine is 12 hours a day), it takes five seconds to find a name and another five to print the address on a label.

Writing "Personal" Letters

This is not all the Mailing List programs can do—not by a long shot. Another feature is the WORD PROCESS INTERFACE. Using a separate word processor program from Futura Software, you can put in special access codes for writing letters. Then, by means of this word processor interface program, you are able to put names and addresses



November 3, 1982

Hello fellow 99'ers,

Instead of our normal advertisement, I believe it is more important to explain our situation here at Denali Data Design. In twenty months, we grew from a coffee table into several offices. The last 3 months have seen us more than triple our in house staff, lease automated equipment, and farm out piece work in order to continue to fill your orders. Although this increase of business is greatly appreciated, we must admit it took a toll on our new product development.

To those who are waiting for us to release our long announced new products(JOYPADtm, BLACKBOOK 2, TIMEBOOK, etc.), we appreciate your patience. I'm sure your patience has also been appreciated by new users, who finally found a cassette cable, and those others who found themselves with boxes of high technology, but lacking only a few strands of copper to make them work together, along with those whose new wave joysticks required adapting to be used with the game ports.

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into marked spots in the letters—automatically. Neat, huh? You can create letters such as:

"Dear Mr. Jones, we at the TI PCC Notes are sad to find that your name doesn't appear on our 1982 subscription list. We would hate for you to miss a single issue. Therefore, Mr. Jones, we have included a subscription form with your name already printed in the right place. . ."

Of course, Mr. Watson, Mr. Morasczewski and Ms. Schmidt will receive the same "personal" letter. And if you run the letters on an electronic typewriter, each of these people will swear you wrote to them personally. Where in heaven would I find the time or the ambition, pray tell?

Insurance Against Shut-downs

Another sometimes handy option is the REBUILD NAME FILES program. If the: ADD/CHANGE/DELETE program is interrupted by an accidental glitch on the power line (forcing you to turn off the computer completely), it is possible that your name file pointers will be messed up. This program will pull that file from the crash and put you back in shape. All it takes is to load the program, insert your data diskette and let the program do its thing for about ten minutes.

The REORGANIZE FILES program is another highly useful addition. It allows you either to combine two files, or to split one file into several—for example, sorting the names from A to H on one diskette, from I to S on another, and from T to Z on still a third.

Finally (I always keep the *piece de resistance* for last, to savor it) there is a utility program called CONVERT FROM TI LIST. Now, that one saved my life. Can you imagine re-typing 4000-plus names and expecting a no-error transfer? Impossible, you will say. Well, this program does it for you automatically, diskette to diskette, and initializes them for use in the new mailing list. You may also ask it to flash each name on the screen and let you decide, by means of a simple Y or N, if you want that one converted to the new list. I had a lot of garbage collected on the TI data diskettes—names not reachable through the Inquiry or the Search program which I called "untouchables." To my great relief, I got rid of the "untouchables" for good.

The transfer process in automatic mode takes about fifteen seconds per name. Manual mode, which lets you keep or delete a name, takes about twenty seconds per name. To type a name and address faultlessly would take at least a minute—and there is no such thing as "faultlessly." When I typed the names and addresses into the TI Mailing List, I averaged an error every thirty records. That's more than 130 errors among the 4000 names.

Last of all, every self-respecting menu should have an END OF JOB option. (Don't laugh, I have seen programs that made you press CONTROL CLEAR to get rid of them . . . otherwise, they would go in circles.) So, Option B lets you stop the works.

By now, you must have the impression I'm enthusiastic about this program— you bet I am!

Futura Mailing List—$49.95. Available from: Ehninger Associates, Inc., P. O. Box 5581, Fort Worth, TX 76108.

Turtle Arcade... from p.34

plications for coincidence checks. First, the check should "lead" the sprite (i.e., the check should take place a little ahead of the actual target) so that you avoid such implausibles as a ball bouncing off the middle of a paddle. Second, with a rapid-moving sprite, it might "sneak" through a target between coincidence checks. To avoid this, you can make your coincidence checks more lenient by setting up a range as with:

```
TO CHECK
TEST BOTH XCOR > (:XTARGET —
  16) XCOR < (:XTARGET + 16)
IFT OUTPUT YCHECK
END
```

```
TO YCHECK
OUTPUT BOTH YCOR >
  (:YTARGET — 16) YCOR <
  (:YTARGET + 16)
END
```

For some games the target is moving. Because XCOR and YCOR only work for the current sprite, when you change which sprite you are addressing, you also change which sprite address you receive with XCOR and YCOR. Therefore, you must name and store (at least temporarily) the X and Y locations of the slower-moving sprite and then use these as your targets in checking coincidence:

```
TELL slowsprite
CALL XCOR "XTARGET
CALL YCOR "YTARGET
CHECK
. . .
TO CHECK
TELL fastsprite
. . .
```

I hope these ideas help you design a great new game for the Turtle Arcade!

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Oh No!...from p.23

null string to a zero value. The reduced DATA statement is:

```
300   DATA DOE,JOHN,–,,1,3,,,2,3,
      *,3
```

Each zero or other digit takes up three bytes. The statement now uses 50 bytes.

The DATA statement may be "scrunched" even further by removing all the commas between the numbers (put the zero values back in) and reading one string instead or ten:

```
300   DATA DOE,JOHN,–0130023*3
```

This DATA statement requires only 32 bytes.

The corresponding logic changes are:

```
Change 200 READ LAST$,FIRST$,
  INT$
Change 220 PI$=SEG$(INT$,I,1)
```

In this case the number of interceptions was always less than a two-digit number. If you have data that may vary in the length of the string, you may use some sort of delineator, perhaps # or a space. For example, in combining the last name and first name to get rid of the comma and 2 more bytes, we'll use a space between the names. The program segment becomes:

```
200   READ NAME$,INT$
202   N=POS(NAME$," ",1)
204   LAST$=SEG$(NAME$,1,N–1)
206   FIRST$=SEG$(NAME$,N+1,
      LEN(NAME$)–N)
210   FOR I=1 TO 10
220   PI$=SEG$(INT$,I,1)
      :
260   NEXT I
300   DATA DOE JOHN,–0130023*3
```

The original DATA statement of 59 bytes has been reduced to 30 bytes. You will also be able to fit more data in each DATA statement, so for a large number of players there will be a significant savings in memory.

Even though the manual says 112 characters are permitted in a statement, you may have noticed that a DATA statement with lots of commas sometimes causes "LINE TOO LONG" at fewer than 100 characters. If you can combine data, you may avoid this problem.

Combine Strings

You may READ separate strings or calculate numbers and do what is needed with them as separate units, but if they are always associated, put items together in one string. For example, suppose you read in a last name then a first name in an alphabetical list, but later want to arrange the names numerically according to a score. You no longer need last name and first name, so they may be combined:

```
500   NAME$=FIRST$&" "&LAST$
```

Don't GOTO

Look at the structure of your program. Perhaps draw arrows. If you have a GOTO 700, then from 700 have a few lines of programming then GOTO 2780, a few more lines, then GOTO 900, you should rearrange your program so it is executed in sequence. Every GOTO statement you can eliminate frees 10 bytes, besides making your program much more understandable.

Eliminate Unnecessary Statements

Quite often these statements occur during the editing process. Look through your listing for code that should have been deleted, statements that are never accessed, double GOTO statements, or other unnecessary statements. Examples are:

```
300   GOTO 1000
310   GOTO 1040
      :
350   IF A=0 THEN 320 ELSE 360
360   GOTO 800
1000  GOTO 1050
```

Draw Efficiently

Look through the graphics statements and sketch your characters to see if you are drawing in the most

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efficient way. Use the repetition parameter wherever possible, even if some of the in between characters will be replaced. Besides usually saving memory, it is quicker. Here is a way to draw a line with alternating characters:

```
200   CALL HCHAR(5,1,42,31)
210   FOR Y=2 TO 30 STEP 2
220   CALL HCHAR(5,Y,46)
230   NEXT Y
```

Remember the repetitions will go to the next line if you want, so you may use one statement:

```
200 CALL HCHAR(8,1,54,128)
```

instead of three:

```
200   FOR I=8 TO 11
210   CALL HCHAR(I,1,65,32)
220   NEXT I
```

Reduce Logic

ON (numeric expression) GOTO...and ON (numeric expression) GOSUB...may save many lines of IF-THEN coding if you can get the numeric expression reduced to consecutive integer conditions.

One example is using the arrow keys on a split keyboard scan. The codes returned for pressing the arrows keys are:

5 2 3 0

We don't use return codes 1 and 4, and the sequence starts with zero. The codes 1 and 4 will be the second and fifth statement numbers for the sequence, and we want those key codes to return to the CALL KEY statement. Note that it is perfectly okay for some of the statement numbers to be the same after the GOTO or GOSUB. Before the ON n GOTO or ON n GOSUB statement, be sure to eliminate all other numbers greater than or smaller than the number of statement numbers specified. In CALL KEY(0,K1,S1), K1 starts out as −1. In this example, any other key pressed returns to statement 300.

```
300   CALL KEY(1,K1,S1)
310   IF (K1<0)+(K1>5) THEN 300
320   ON K1+1 GOTO 400,300,500,
      600,300,700
400   Procedure for down
500   Procedure for left
600   Procedure for right
700   Procedure for up
```

TI Extended BASIC

The maximum size of a TI Extended BASIC program is 864 bytes smaller than the maximum size of a TI BASIC program. However, there are more memory conserving tricks available in Extended BASIC. A big help is the SIZE command to determine how much memory space is free. This feature lets you experiment to see how much memory is taken up by various commands or procedures.

Stack Statements

More than one statement may be on a line, (up to 140 characters). Multiple statement lines not only save memory, but also speed the program execution. Multiple statements on a line must be separated by a double colon. Using this mark requires that multiple colons in a PRINT statement be separated by a space.

Define Four Characters at Once

Sketch and plan your graphics to take advantage of defining four characters with one statement, and using different magnification factors. A sprite with a magnification factor of 4 is actually made up of four characters and is double size, so you can have quite a large sprite just by specifying one character number in the CALL SPRITE statement. Economize with sprite commands. CALL MOTION, CALL SPRITE, and CALL PATTERN may specify more than one sprite at a time.

Think Through the Logic

Extended BASIC allows complex IF-THEN-ELSE statements, and you may use either statement numbers or commands. Map out your logic to take advantage of these capabilities with the fewest number of statements.

Continued on p. 40

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Oh No! . . . **from p.39**

TI BASIC required several lines of code to line up a list of figures or print a list of names in straight columns. IMAGE and PRINT USING or DISPLAY USING require little effort to left-justify string variables and right-justify numbers.

Assign More Than One Item

You may assign more than one variable at a time, like in initialization.

```
100   T,A,B,C=1
```

assigns 1 to each variable T, A, B, and C using one statement instead of four.

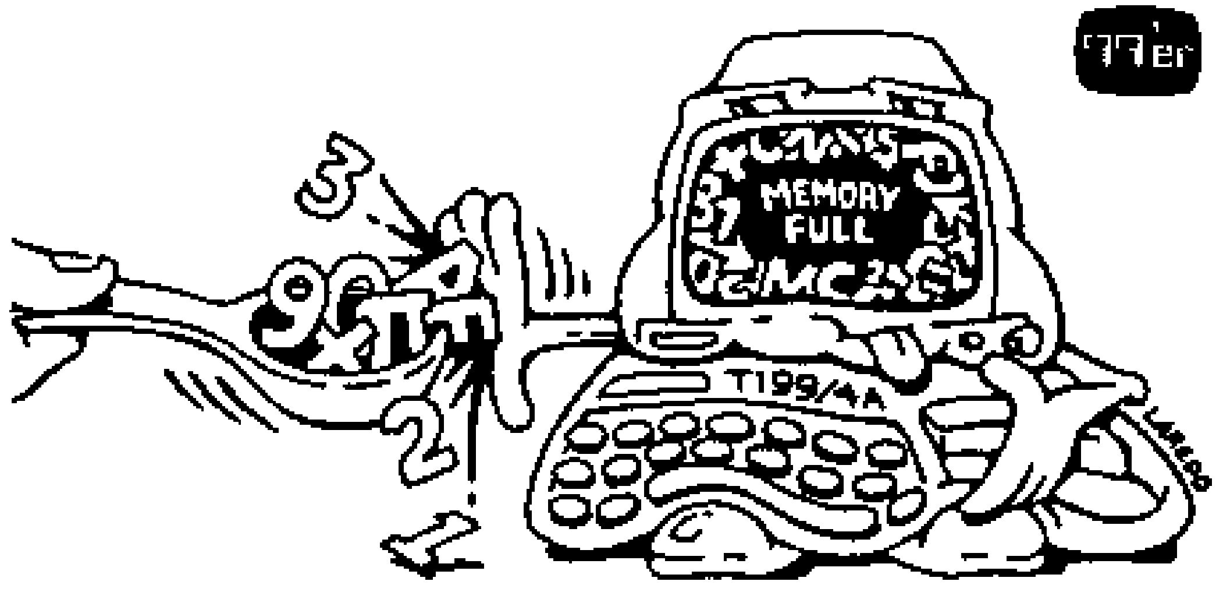
Repeat

Use RPT$ in string handling to repeat a string expression any number of times (up to a string of 255 characters). An example to define four striped graphics characters for two sprites is:

```
100   CALL CHAR(100,RPT$("00FF",
      16))
110   CALL MAGNIFY(4)
120   CALL SPRITE(#1,100,7,20,100,
      -5,5,#2,100,5,88,100,7,-4)
130   GOTO 30
```

Finally—*Use* Extended BASIC

Read through the list of available built-in subprograms. Some of them may be able to replace several lines of code. You may as well let the computer do the work, as well as use less memory. 99'er



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DEBUGS ON DISPLAY

Screen Dump Utility

Try as we might, occasionally an error slips by the editorial desk. Two such errors were discovered in **Super Language: A Screen Dump Utility—Part 2** in the November 1982 issue. The first error occurs on Page 19, Column 2 about one-third of the way down. In the description for setting up the PAB, Bytes 10-35 should read:

·File Descriptor. We'll use RS232.PA=N.DA=8.BA=9600.CR

The second error occurred on page 24, Column 2 under **Mini-Memory Considerations**. Step 5 should read as follows:

5. Put the entry point for DUMP into the DEF/REF table by entering the following lines:

```
AORG  >  7FEB  (CR)
TEXT 'DUMP     '(CR)
DATA  >  7D14  (CR)
```

Note: There are 2 spaces required following the word DUMP in the above text directive for a total of 6 characters within the single quote marks. 99'er

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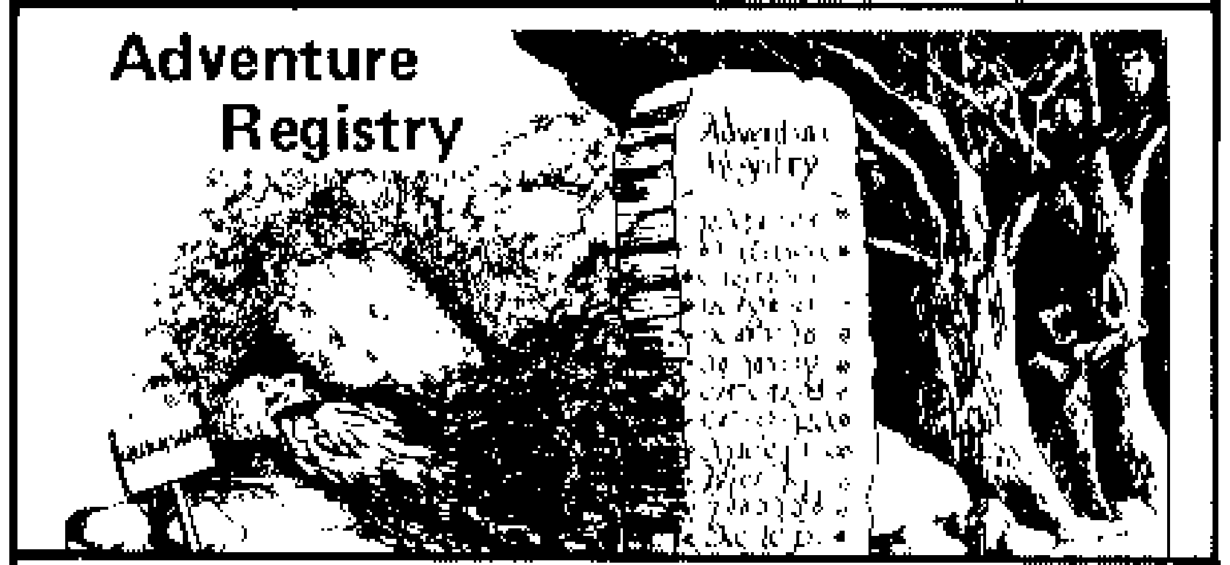
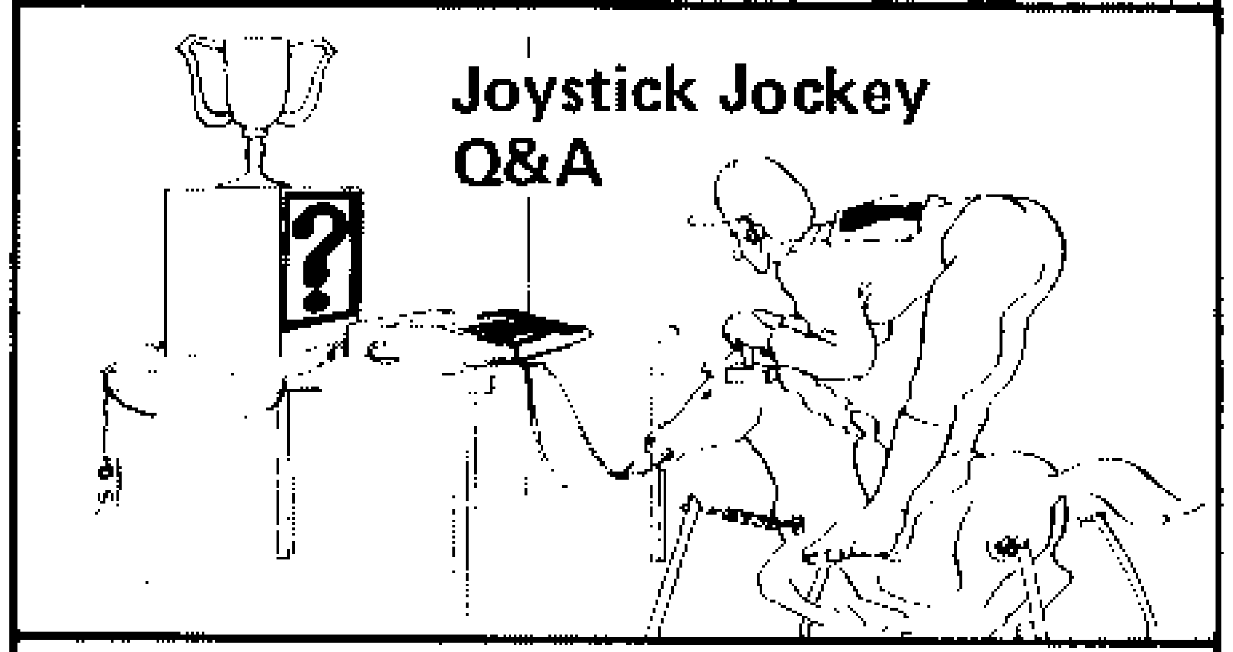
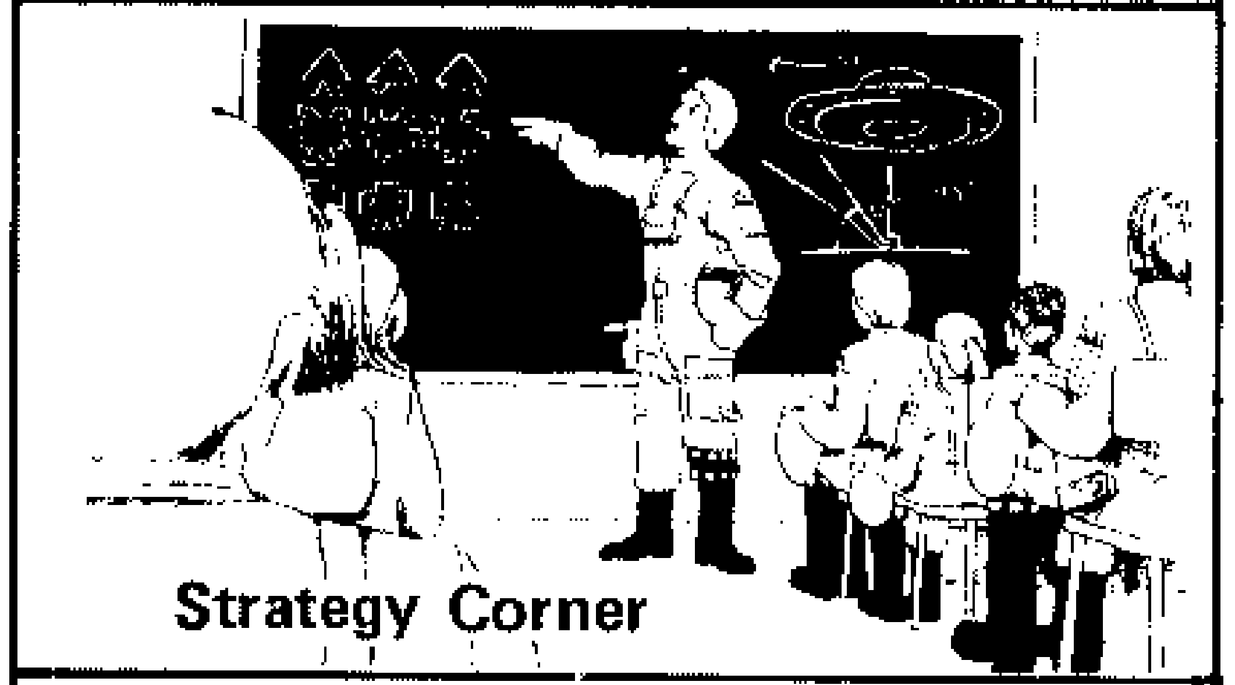
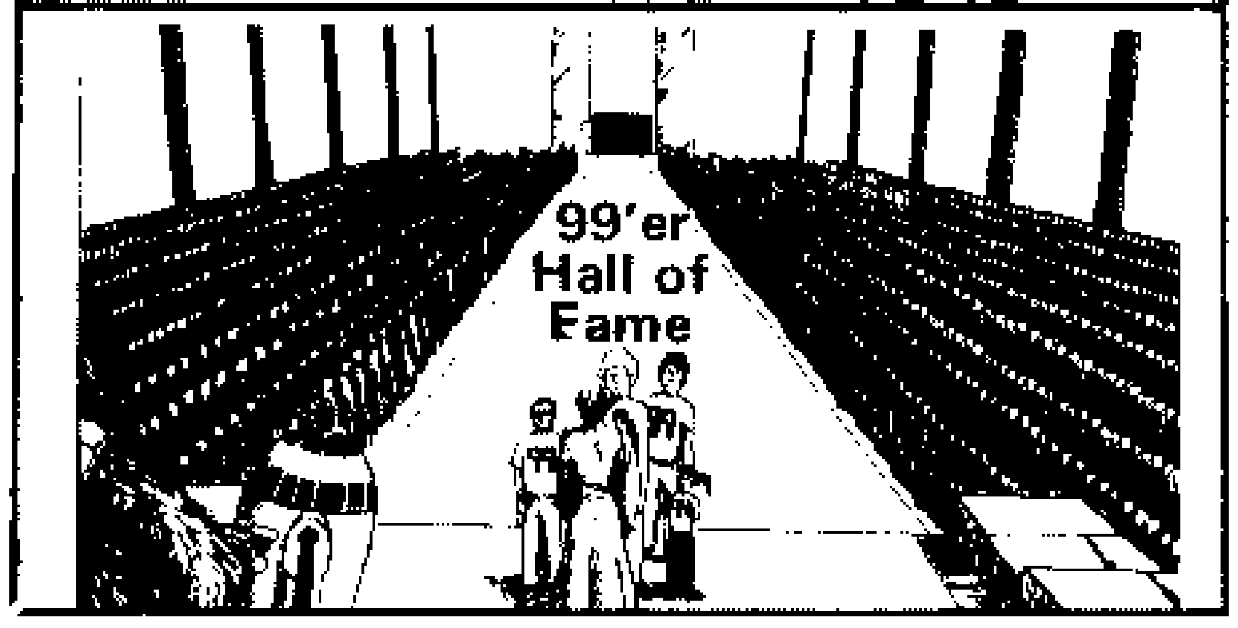






Arcade Arbiter Review



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Upon completion, another program loads automatically. You are then asked for the name of your character. Each character has four traits to which you assign random numbers given by the computer. The numbers assigned determine how well you can do things—fight or make friends, for example. If the character survives, his name and score is stored on disk and may be used later if you like.

At this time, you can proceed with the basic scenario, or put in another diskette with a different adventure—new rooms, treasures and monsters. Scenarios II and III are available at $12.95 each, and require the original diskette ($24.95) to run them.

You select from four skill levels, and then the scenario is loaded into memory. The character shows up in one of more than 120 rooms containing 25 monsters, various treasures, devices, and weapons. Unlike most adventure programs using commands such as "TAKE KNIFE," there are instead, 14 major commands. These include four directions (N, S, E, W), attack (A), run (R), make friends (F), get, drop, or use something (G, D, U), look (L), inventory (I), condition (C), or quit (Q). This limits things somewhat, but not for experienced adventurers; it does, however, make it easier for the *new* adventurer to get a feel for these games. Like any adventure, there are the usual tricks that participants pick up along the way.

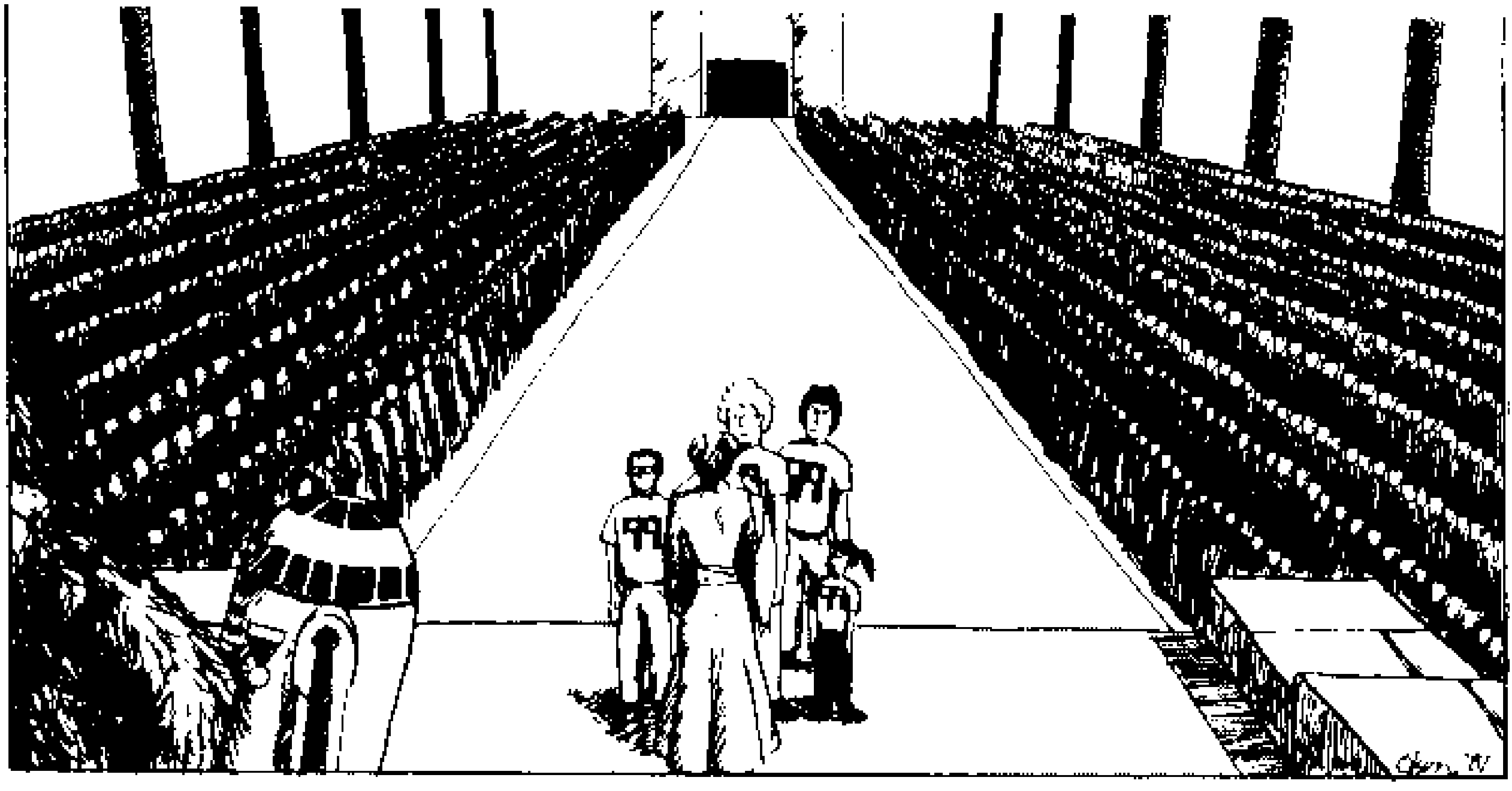
The object of *Ringwraith's Lair* is to rescue the princess and return her to safety—a task not easily accomplished (not to mention, trying to maximize your score!). In trying to get through the Lair and rescue the princess, you'll discover two less-than-ideal situations: One, you cannot save the game in progress in order to continue later. This means that if you quit, you kill the character, and you must start from scratch. Therefore you'll have to record your progress on a map so you can re-trace your path. The second problem is fighting an enemy. The blow-by-blow description of the battle can get quite boring—especially after you miss ten times and your opponent hits you once. You just want to get the battle over with, and a minute later they're still going at it. Sigh! Just to print the outcome of the battle would have been better. Oh well, what game is perfect?

All in all, *Ringwraith's Lair* is a fair game—a welcome addition to the family of available third-party software for the TI Home Computer. If you're an adventure fan, this game will probably be worth the money to you. If you're new to this game genre (and have the necessary peripherals), it will give you a pretty good idea of what adventuring is all about.

Now, back to the adventure. How in the world do I get past those fire-breathing dragons? Hmmmmmmm . . . . .

Ringwraith's Lair is available in Extended BASIC through Fantasy Computing, 1586 South Citrus, Escondido, CA 92027.

99'er HALL OF FAME



This month's inductees all proved their merit under the competitive pressure at the 99'er TI-Fest gaming contest. Each 1st-place winner received a Home Computer and Software.

Name: Quyen Ton (of San Francisco, CA)
Game: Munch Man
Score: 293,970

Name: Barry Fishman (of Gladwyne, PA)
Game: TI Invaders
Score: 18,514

Name: Sean Lynch (of Portland, OR)
Game: Parsec
Score: 44,900

PARSEC
LAREDO

An Arcade Game Review

By C. O. Umber
Silicon Gulch, CA

My pockets finally emptied of quarters, I started for home. Overall, it was an enjoyable evening—plenty of video arcade action and excitement. Anyone observing me would have found it hard to believe that I was actually "working." That's because *my* work is what others regard as "play". . .

You see, I'm a video game designer. You've probably never heard of me personally—even though some of the games I've worked on have achieved a fair measure of success and are presently quite popular. I'm not a name-dropper and don't like to brag, so don't worry—you won't be subjected to a long, boring list of credits and accomplishments. Let the others take all the glory; the pleasure of the work itself is reward enough for me.

Although I look just like any other skillful game player while *at* the arcade—albeit, somewhat older than the average "hot-shot"—it's what I do when returning *home* that marks me as a professional: out comes a large pad of graph paper and colored marker pens, and on goes my word processor. What I attempt to do is make detailed notes of everything I've seen, heard, and experienced. I also draw accurate pictures of the interesting or unusual screen effects and dump the evening's recorded audio from the microcassette (in the pocket recorder I always carry with me) to a master tape in my library of arcade sound effects. Each new noise, musical passage, and speech pattern must then be carefully catalogued and indexed. As you can see, we game designers take our research work seriously.

On this particular evening, something bothered me—a strange feeling I couldn't quite put my trigger finger on. As I made my last entry in the computerized diary, and got ready to pull the big plug and turn in for the night, a sudden blinding flash of psychic energy riveted me to my ergonometric chair and put me into what my worried wife later described as a trance-like state—complete with glazed eyes, shallow breathing, and obliviousness to my surroundings. I had *seen* it. . .the "ultimate" video game!

The next few days found me working at a feverish pace—trying to get down in some kind of recorded form everything I had seen in that rare split-second of eternity that most inventors can only dream of stumbling upon. By mid-week I had finished. Satisfied that all my thoughts were either safely down on paper or recorded on magnetic media, I packed my bags and headed for 99'er TI-Fest in San Francisco where I hoped to see some of the new Texas Instruments arcade gaming software.

It didn't take me long to zero in on the main gaming attraction—*Parsec.* The vivid imagery, spectacular explosions, and mysteriously monotonic female voice echoing all over the hall couldn't help but arouse the competitive nature of one battle-scarred joystick jockey like myself.

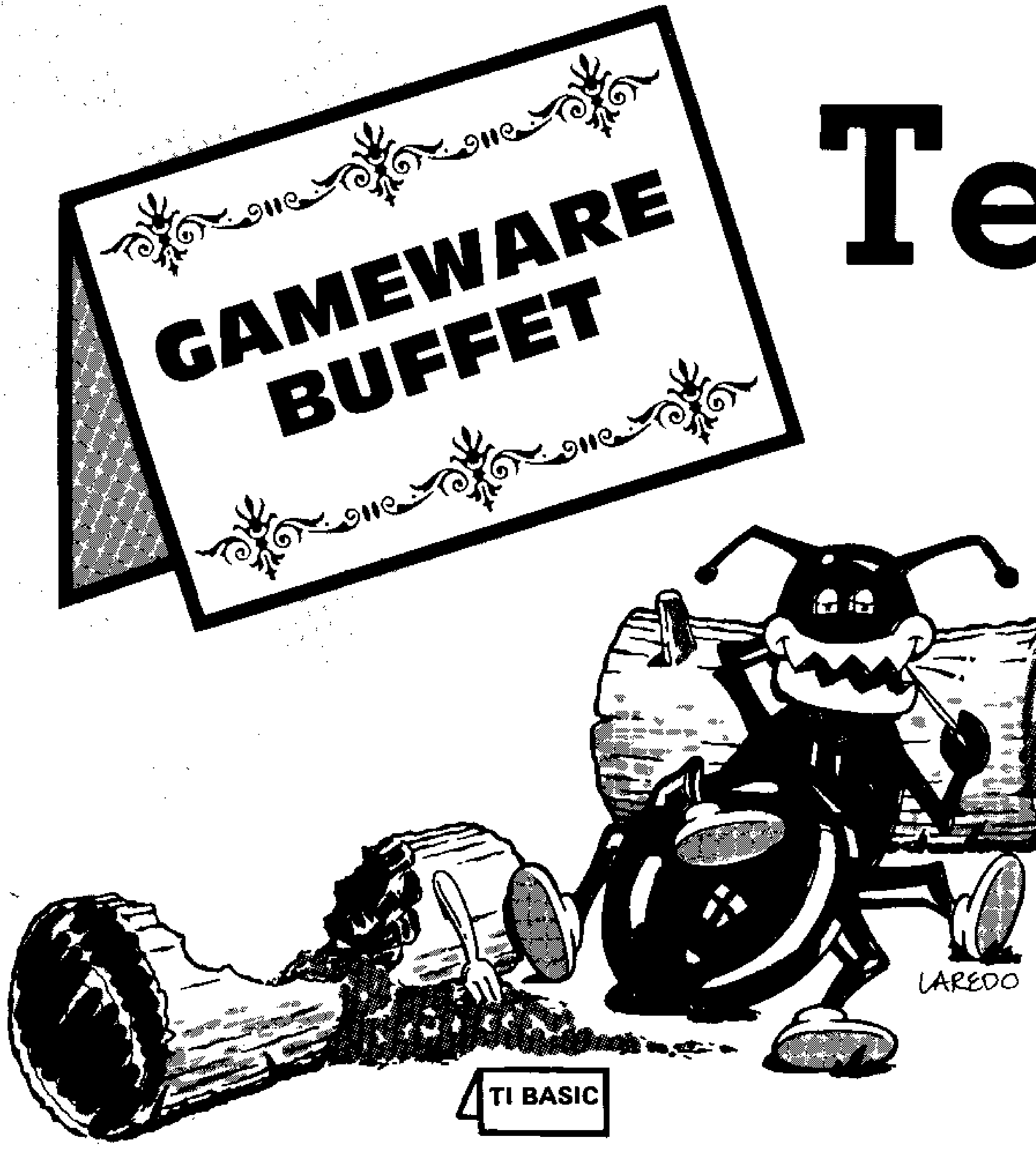
The Computer Gaming Land contest was well underway and I had a hard time finding an empty *Parsec* station. Finally, one trigger-happy senior citizen blew up his last ship when his own laser overheated. Shaking his head in utter disbelief, he headed for the showers. . . This was my chance. Paying no attention to the glares and stares of other showgoers as I leapt over two wheel chairs, elbowed my way through a visiting users group, and did an end run around a trio of TI judges, I dove for the vacant joysticks and immediately obeyed the mysterious "electronic lady" when she told me to "press fire to begin."

It wasn't hard for an old arcade pro like me to spot the elements of *Parsec* that I first saw in three of the most successful arcade games of all time: As in *Defender* and *Scramble,* there is the illusion of flying over a planet's surface, the multi-level battles with a variety of alien craft, the required fuel monitoring and replenishment, and the dramatic explosions simulated by what appears to be over 100 pieces of radiating debris. And, as first seen in the immensely popular *Asteroids* game, *Parsec* contains the dual elements of maneuvering and blasting to avoid collisions with deadly chunks of space rock hurling toward a player's ship.

This is definitely *not* to say that *Parsec* is a "me-too" game—a silicon copy of any of its arcade predecessors. On the contrary, this new Texas Instruments game is refreshingly different. For one thing, the separate elements are cohesively orchestrated into a visually and audibly stimulating action and strategy game that is both easy to learn and more importantly, creates an environment (of minimum intimidation) where playing skills may be progressively honed. This allows players of all ages to *learn* from the game and experience the satisfaction of improving their scores on a regular basis.

If you don't think this is important, just observe several players at a *Defender* arcade machine. You'll only see *two* types—the gaming pros like me who score a zillion points and can stay there a week on change of a dollar, and the vast majority of players who attempt to "get into" the game with a handful of quarters and never last more than ten seconds! Without fail, every one of these players who suffers this humiliating defeat ultimately swears off the game and even avoids

Continued on p. 47



Termite

By James R. Dew

4050 Shoreline Drive
Robbinsdale, MN 55422

Here is a termite that doesn't deserve a visit from the tan man in the unmarked van. This bug will be welcome in any home—wood-frame or otherwise—as long as the place is furnished with a TI-99/4A.

TERMITE is a simple game, easily grasped by children, yet challenging and amusing enough to attract the attention of adults.

Your goal is to guide a termite through a block of wood (left to right) on the screen. The keyboard arrow keys control the little guy's movement. The block of wood is peppered with knots that the termite cannot chew through. If he hits a knot, he has to go back and start over. Of course, the knots in the wood are invisible, making the job a little tougher.

There are two levels of play in TERMITE. In the first level, when the termite runs into a knot, the locations of all knots in the wood flash briefly on the screen.

Gold Rush

By William K. Balthrop

99'er Staff

Extended BASIC
CLAIM
DYNAMITE
LAREDO

Everyone was doing it and why not! There was always a chance of striking the mother lode. People came from all parts of the country in search of riches. I too was caught up in the excitement, and before I knew it, I was on the trail with my pick, shovel, and two crates of dynamite.

I must have drifted for weeks before I settled on my claim. I don't know why I picked this spot—just a feeling I guess. The first day I hit solid rock — but I'm not one to get discouraged easily, so I started a new shaft. I was luckier this time, the loose dirt and rocks making for easy digging. I hadn't scratched as deep as my boot tops before my feeling about this area began to pay off.

It was only a small vein but it was gold! That yellow stuff so many people have lived and died for. I just knew this was the end of the rainbow . . . then, a few days later I hit solid granite! The only way through was to blast with dynamite, so I lit the fuse and ran like the devil. It was close, but the granite was cleared, and behind it was the most beautiful streak of gold I had ever seen. Little did I know that my luck was about to change.

I had gone back near the head of the mine when disaster struck. The wall began to crack and a gush of water flooded the entire shaft! This mining business is full of danger . . .

Sooner or later, you'll remember the location of the knots and be able to guide your termite safely through the wood.

In the more difficult mode of play, the only knots shown are the ones you hit, and the game gets considerably tougher.

Programming Notes

For the sake of simplicity, this game contains logic generally considered poor programming practice. I refer to line 1550 which jumps into line 1570 upon a win. But line 1550 is in a subroutine, while the code starting at line 1570 will never do a RETURN! Instead, the main program is re-entered by a GOTO.

It works in this particular program because this code can only be executed twice — once for each level of play. If you did this in some programs, the result would eventually be a *MEMORY FULL* error message.

EXPLANATION OF THE PROGRAM
TERMITE

Line Nos.	
100-340	Initialization
350-480	Animated sequence for introduction
490-690	Instructions
700-870	Main program loop
880-990	Hitting a knot
1000-1040	Subroutine to munch
1050-1240	Subroutine to disperse knot holes randomly
1250-1320	Subroutine to draw wood block
1330-1560	Subroutine to move termite
1570-1670	Routine to process a win
1680-1760	Input subroutine
1770-1890	Routines to define termite characters based on orientation
1900-1920	Subroutine invoked when too many turns are taken

```
100 REM  ************
110 REM  * TERMITE  *
120 REM  ************
130 REM  BY J R DEW
140 REM  99'ER VERSION 2.2.1
150 REM
160 REM
170 CALL CLEAR
180 RANDOMIZE
190 PRINT "PRESENTING.........":::
    ::::::
200 FOR X=1 TO 14
210 Z$=Z$&CHR$(104)&" "
220 NEXT X
230 GOSUB 1830
240 FOR X=1 TO 11
250 PRINT Z$::
260 NEXT X
270 FOR X=1 TO 5
280 GOSUB 1010
290 NEXT X
300 DIM M$(9)
310 DEF RI(X)=INT(RND*X)+1
320 CALL CHAR(96,"FFFFFFFFFFFFFFFF"
    )
330 CALL CLEAR
340 CALL COLOR(9,12,1)
350 GOSUB 1250
360 CV=8
370 CH=6
380 D=3
390 FOR A=1 TO 15
400 GOSUB 1330
410 NEXT A
420 D=2
430 GOSUB 1330
440 GOSUB 1330
450 D=4
460 FOR A=1 TO 10
470 GOSUB 1330
480 NEXT A
490 PRINT TAB(10);"TERMITE":::"WANT
     INSTRUCTIONS (Y/N)?"
500 CV=CV-4
510 K$="YN"
520 GOSUB 1730
530 IF K=ASC("N")THEN 700
540 CALL CLEAR
550 PRINT "THIS IS THE GAME OF"::TA
    B(10);"TERMITE"::"IN WHICH YOU
    MUST GET YOUR  TERMITE THROUGH
    THE WOOD"
560 PRINT "WITHOUT HITTING THE KNOT
    S.  YOU MAY USE THE ARROW KEYS
     TO GET FROM THE LEFT TO THE RI
    GHT."::
570 PRINT "PRESS ANY KEY"
580 CALL KEY(0,K,S)
590 IF K*S=0 THEN 580
600 CALL CLEAR
610 PRINT "WHEN YOU HIT A KNOT, YOU
    ":"MUST START OVER. IN THE":"EA
    SY VERSION, I WILL SHOW"
620 PRINT "YOU WHERE ALL THE KNOTS
    ARE BEFORE YOU START OVER. IN":
    "THE TOUGH VERSION, YOU HAVE TO
     USE YOUR HEAD"
630 PRINT ::"PRESS ANY KEY"
640 FOR X=1 TO 4
650 PRINT Z$::
660 NEXT X
670 CALL KEY(0,K,S)
680 GOSUB 1010
690 IF K*S=0 THEN 670
700 CALL CLEAR
710 PRINT "SELECT LEVEL OF PLAY":::
    ::::"1-EASY":"2-TOUGH"::::::::
```

Continued on p. 48

The Program

When I started programming "Gold Rush," I tried to simulate the prospector's dangers and rewards by setting up the screen so that the player could explore and actually see his mine being created.

The game begins with your miner standing on top of a block of earth. The miner is restricted to digging in any of three directions, down, left, or right. To move the miner, merely press any of the four arrow keys, "E,D,S,X."

There are two ways to dig. The first is simply to *mine* a section. This is done by pressing the "M" key, followed by an arrow key for the direction of the dig. If the earth is not made of solid rock, or granite, the area you mined will clear, any gold ore discovered will be added to your score, and the miner will advance into that area. The other method of digging is to blast . . .

On the surface is a small shack containing three boxes of dynamite. Each box contains ten sticks for blasting through solid rock, or granite. To pick up the dynamite, first position the miner over it and press "P." The dynamite will now follow you everywhere until you drop it by pressing "P" again. You set the dynamite and light the fuse by pressing "L" followed by an arrow key to designate which direction you are blasting (You can't blast upwards).

Once the arrow key is pressed, the fuse will start burning. You have about five seconds to get out of the area or be blown to bits! The miner must be at least *three character spaces* from the explosion.

You may have the misfortune of running into an underground stream. If you are lucky, you will discover the stream while digging downward, and that will be the end of it. Should you hit the stream while digging to the left or right you will have to move fast to keep from drowning in a *mine flood*! If the flood waters reach a downward shaft it will take that course until it must turn left or right. The flood will continue until there is no place left for it to go. Good luck and happy mining—the gold bug is coming, and he's looking for you . . .

[If the disk system is used without the 32K memory expansion, enter CALL FILES(1) before loading *Gold Rush*—Ed.]

EXPLANATION OF THE PROGRAM
Gold Rush

Line Nos.	
100-150	Rem statements, title and version.
160-170	Display the title screen.
180-200	Initialize variables.
210	Display level of play screen and input level.
220-260	Initialize variables for screen messages.
270-510	Initialize the mine area. Placement of rock, granite, gold, and underground streams.
520-610	Initialize graphics charactors, and display playing screen.
620-720	Main control loop. Read keyboard and branch.
730-800	Move miner up.
810-890	Move miner left.
900-980	Move miner right.
990-1040	Move miner down.
1050-1130	Pick up, or drop dynamite.
1140-1450	Light dynamite.
1140-1150	Display message, check for position.
1160-1200	Read keyboard.
1210-1250	Place dynamite to the left.
1260-1280	Place dynamite to the right.
1290-1310	Place dynamite downward.
1320-1340	Countdown for fuse burning.
1350-1370	Explode dynamite.
1380-1390	Place new ladder in tunnel.
1400	Clear the shaft.
1410-1430	Check for ore content.
1440-1450	Hit gold.
1460-1800	Hit underground stream.
1460-1480	Display initial stream.
1490-1510	Check for direction of flow.
1520-1570	Flood to the left.
1580-1630	Flood to the right.
1640-1670	Flood down a shaft.
1680-1730	Check for a branch in flooding.

Continued on p. 46

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If you answered YES to all questions above, please reply in strictest confidence to: 99'er Talent Hunt
1500 Valley River Drive, Suite 250 Eugene, OR 97401

Gold Rush... from p.45

1740	Display message for getting killed.
1750-1800	Read keyboard, and branch to move during the flooding.
1810-2180	Mining subroutine.
1810-1860	Read keyboard and branch to mine in any of three directions.
1870-1960	Mine to the left.
1970-2060	Mine to the right.
2070-2180	Mine down.
2190-2210	End of game message option to play again.
2220-2270	Data for display, and sound.
2280	Read data and display subroutine.
2290	Read data, display, and input response.
2300	Read data, display, and input response with the validate option.
2310	Display for Line 22 on the screen.
2320	Display for Line 24 on the screen.
2330	Subroutine to scan keyboard until a key is pressed.
2340-2390	Subroutine to manipulate the contents of the mine.
2340	Initialize beginning of subroutine. P1 = x coordinate, P2 = y coordinate, z = the contents of the mine when m = 2, z = the value to place in the mine when m = 1. When m = 3 the mine is initialized.
2350-2360	Check for m(mode) initialize mine.
2370-2380	Check for m, return the value in the mine to variable z.
2390	Place new value from z, into the mine.

```
100 REM *******************
110 REM *   GOLD RUSH     *
120 REM *******************
130 REM * BY W.K.BALTHROP *
140 REM 99'ER VERSION 2.2.1XB
150 REM
160 CALL CLEAR :: CALL SCREEN(16)::
     DIM DC(4)
170 RESTORE 2220 :: GOSUB 2280 :: G
    OSUB 2280 :: GOSUB 2280 :: GOSU
    B 2330
180 CALL CHAR(96,"FFFFFFFFFFFFFFFO
    O"):: CALL COLOR(9,2,5)
190 SM1=9 :: SM2=169 :: D1,D3,D5=9
    :: D2=193 :: D4=201 :: D6=209 :
    : DC(2),DC(3),DC(4)=10
200 CALL AR(0,0,0,3)
210 CALL CLEAR :: RESTORE 2240 :: F
    OR X=1 TO 6 :: GOSUB 2280 :: NE
    XT X :: GOSUB 2300 :: B=VAL(AN$)
220 D1$="UP" :: D2$="LEFT" :: D3$="
    RIGHT" :: D4$="DOWN" :: D5$="NO
    T THAT WAY" :: D6$="TAKE DYNAMI
    TE"
230 D7$="OK" :: D8$="NO DYNAMITE" :
    : D9$="DROP DYNAMITE" :: D10$="
    LIGHT FUSE" :: D11$="INPUT DIRE
    CTION"
240 D12$="NO DYNAMITE..." :: D13$="
    CAN'T DO THAT" :: D14$="FUSE BU
    RNING" :: D15$="SHAFT IS CLEAR"
250 D16$="GOLD!-VALUE$" :: D18$="DI
    RT." :: D19$="SOLID ROCK."
260 D20$="GRANITE" :: D21$="FLOOD!"
     :: D22$="YOU'VE BEEN KILLED IN
     A" :: D23$="BLAST"
270 CALL CLEAR :: RESTORE 2230 :: G
    OSUB 2280 :: RANDOMIZE
280 FOR X=1 TO B*30 :: P1=INT(RND*1
    9)+1 :: P2=INT(RND*28)+1 :: CAL
    L AR(P1,P2,2,2):: NEXT X
290 FOR X=1 TO B*20 :: P1=INT(RND*1
    9)+1 :: P2=INT(RND*28)+1 :: CAL
    L AR(P1,P2,3,2):: NEXT X
300 FOR X=1 TO B*5 :: P1=INT(RND*18
    )+2 :: P2=INT(RND*27)+1
310 CALL AR(P1,P2,5,2):: CALL AR(P1
    ,P2+1,5,2):: NEXT X
320 P1=INT(RND*10)+10 :: P2=INT(RND
    *26)+2
330 FOR FM=0 TO 2 :: NZ=INT(RND*151
    )+100 :: CALL AR(P1,P2+FM,NZ,2)
    :: NEXT FM
340 P3=P1 :: P4=P2
350 FOR X=1 TO 10
360 P1=INT(RND*9)+P3-4 :: P2=INT(RN
    D*11)+P4-5
370 IF P1>19 OR P2<1 OR P2>28 THEN
    360
380 CALL AR(P1,P2,Z,1):: IF Z<4 THE
    N NZ=INT(RND*75)+26 :: CALL AR(
    P1,P2,NZ,2)ELSE GOTO 360
390 NEXT X
400 FOR X=1 TO 10
410 P1=INT(RND*10)+10 :: P2=INT(RND
    *28)+1
420 CALL AR(P1,P2,Z,1):: IF Z<4 THE
    N NZ=INT(RND*25)+10 :: CALL AR(
    P1,P2,NZ,2)ELSE GOTO 410
430 NEXT X
440 FOR X=1 TO 20
```

Continued on p. 49

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PARSEC... **from p.43**

walking too close to the machine on subsequent visits to the arcade. . .

Parsec is a rare blend of 16-color graphics, human-quality synthetic speech, animation, and sound effects. It truly shows off the features of what is obviously a marvelous game machine—one that is, however, marketed as a "home computer." If this is any indication of multi-purpose home machines to come, the games-only machines (a la Atari VCS) will soon be relics of the past.

The natural, life-like speech adds an important element to the game play. The *female* synthesized voice (the speech synthesizer is necessary if you want to hear it) enhances the game by simulating a starship's onboard computer; it warns of oncoming alien craft and refueling tunnels, informs you when your lasers are "on target," let's you know when extra ships and points are awarded, and congratulates good performance. Although not necessary for play, the voice allows you to concentrate more fully on activity above the planet's surface instead of having to visually check messages printed at the bottom of the screen.

If you plan on purchasing *Parsec*, I suggest you also invest in some good joysticks. The standard TI issue I used at the show performed adequately enough. There were also a few other brands being sold at some of the exhibitor booths, but I didn't get a chance to try them. From my observation of show players, I predict that *Parsec* addictees—and this game will *definitely* foster a fair share of them—will inevitably experience a case of "joystick cramps" in their early bouts with the game. This results from clutching the joystick too tightly in the heat of fierce combat. After a player learns to relax more and avoid unnecessary vertical movement and laser bursts, his or her score should increase dramatically; the pain and numbness in the fingers and hand will then also disappear.

Of course, use of joysticks can be avoided altogether because the keyboard has also been programmed for lateral and vertical movement, as well as firing the laser. Professionals like myself, prefer the keyboard to joysticks. The interaction is faster and more precise—but it takes a while to build up the necessary finger dexterity. Joysticks do, however, allow a player to comfortably sit back further from the screen, and they enhance the realism of ship control—especially when navigating through treacherous, narrow subterranean passages or through dense fields of tumbling asteroids.

But even though a player uses joysticks, some involvement with the keyboard is still necessary. For example, pressing the number keys 1, 2, and 3 varies the speed (and hence, affects the sensitivity of the joystick) at which a player's ship can move vertically. (I like Lift 3 for doing battle with all shooting ships—e.g., the DRAMITES, URBITES and BYNITES; Lift 2 for navigating my way through the asteroid belts and tracking the devious ramming-type craft—e.g., SWOOPERS, SAUCERS, and low-flying LTF's; and Lift 1 for traversing the underground fuel tunnels). A joystick user might also want to freeze the action (an excellent learning device, but frowned upon in competition) by depressing the console's P key.

As I said earlier, the action and special effects are skillfully integrated. The two TI programmers Jim Dramis and Paul Urbanus [see the January issue for our "Designer's Spotlight" interview with Mr. Dramis—Ed.] evidentally knew just what they were doing. *Parsec* is indeed a highly polished arcade game. It provides an excellent "keep 'em at home" form of family entertainment (especially on a large-screen projection TV), and is an ideal software package—just plug in the cartridge and press a couple of keys—for video gaming competition. And at a suggested retail of $39.95, the price is right. . .

Speaking of competition, I didn't notice when a crowd of people started gathering around me during the TI-Fest

Continued on p. 64

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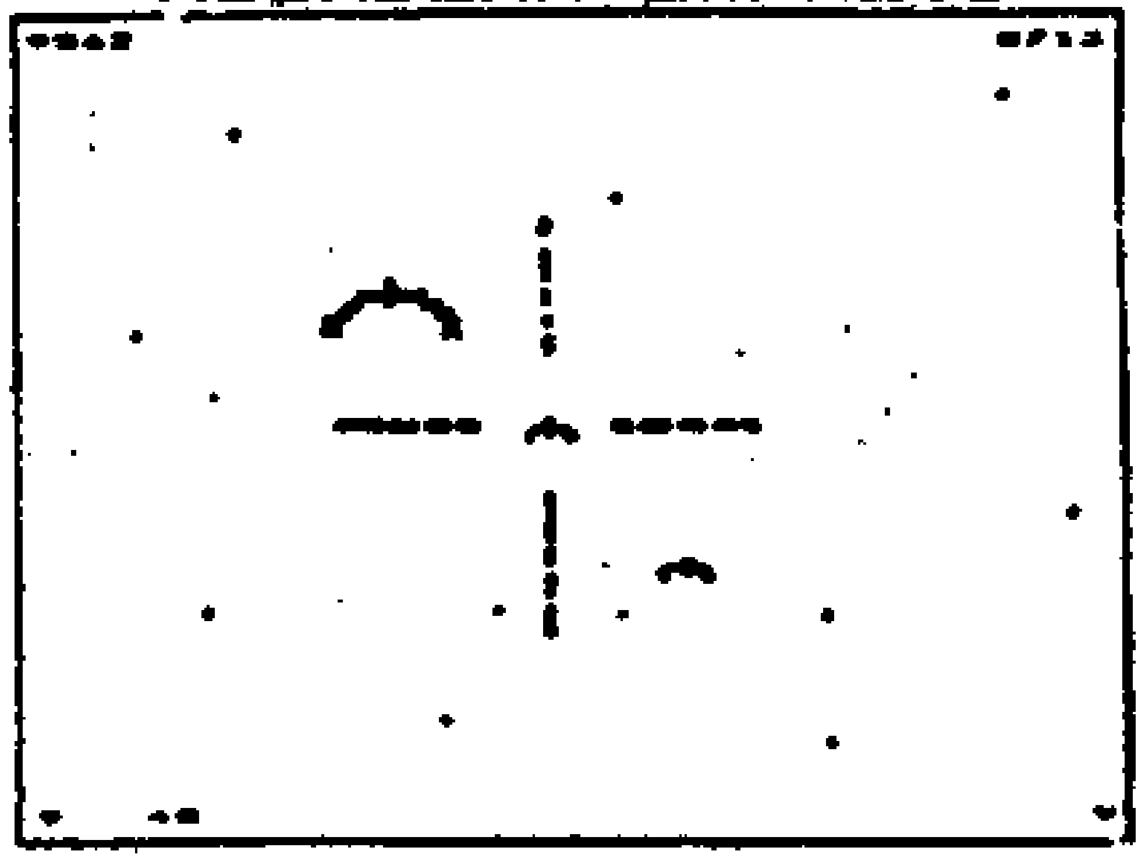

Can YOU make it to the OUTPOST deep within QUADRANT 9? Will the ENEMY FIGHTERS shoot you down? Line them up in your SCOPE and BLOW them out of the UNIVERSE...

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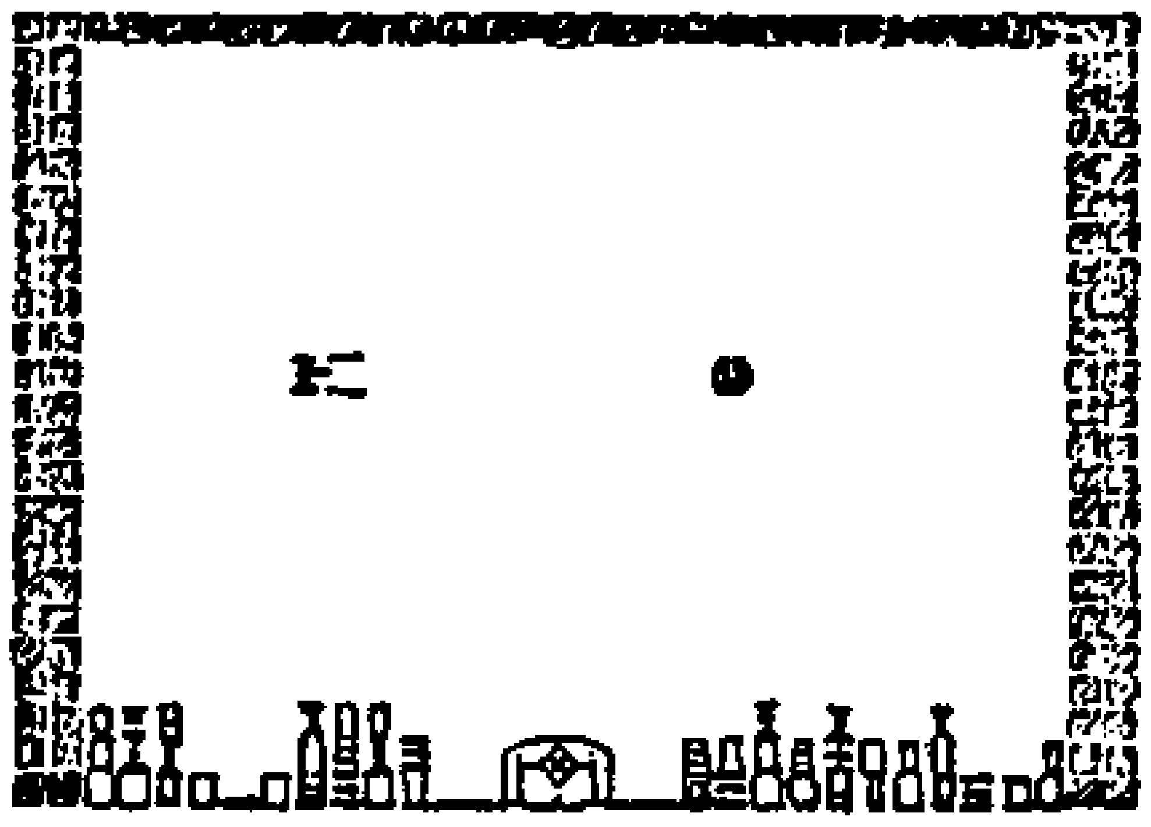

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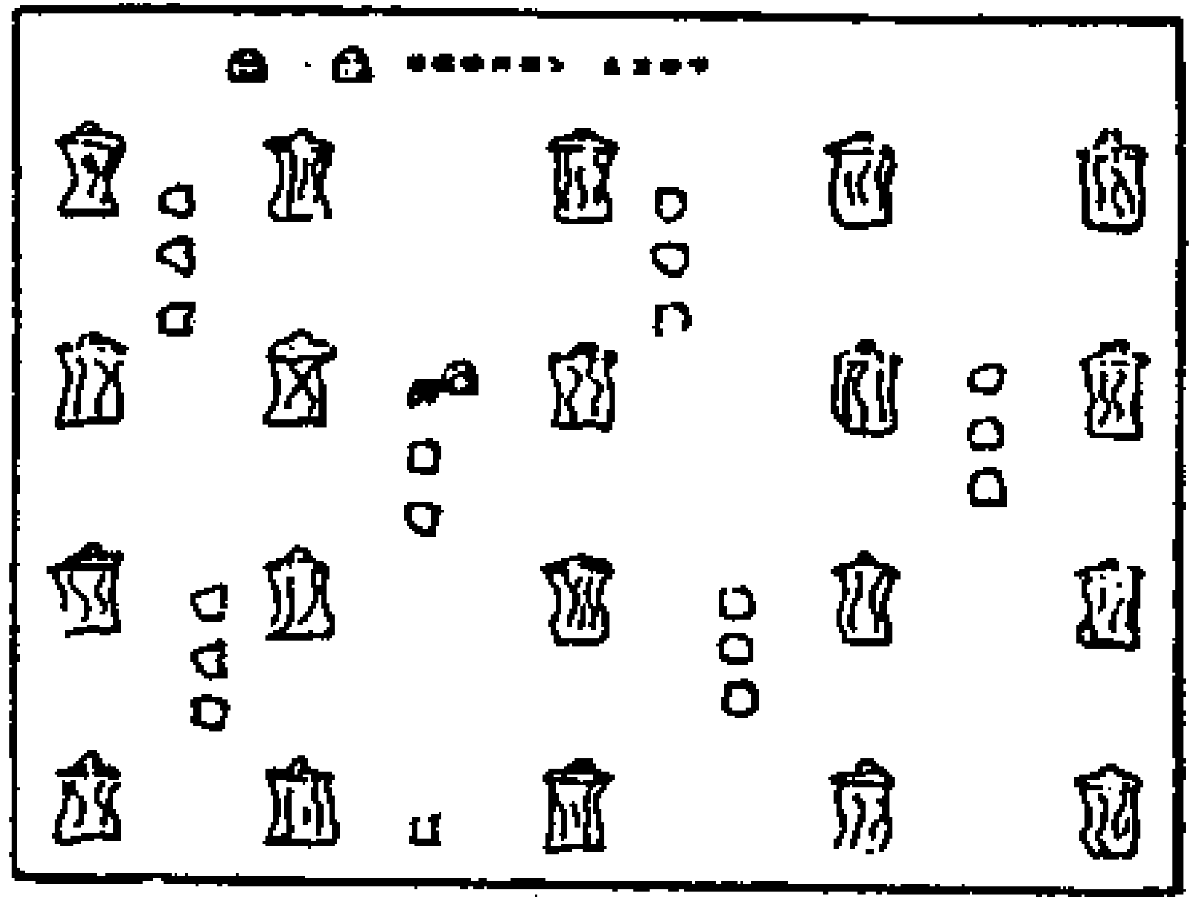
GARBAGE BELLY



Move the GARBAGE BELLY around the field of GARBAGE PAILS! Make him eat RIPE GARBAGE! BUT WATCH OUT! if you make him eat RAW GARBAGE he will immediately DIE...

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Termite... from p.45

```
720 K$="12"
730 GOSUB 1730
740 L=D
750 CALL CLEAR
760 GOSUB 1250
770 T=0
780 GOSUB 1050
790 GOSUB 1100
800 K$="EXDS"
810 GOSUB 1730
820 GOSUB 1330
830 IF CH=5 THEN 810
840 IF T>28 THEN 1900
850 CALL HCHAR(1,3,64,T)
860 IF SEG$(M$(CV-5),CH-5,1)="#" TH
    EN 880
870 GOTO 810
880 FOR X=990 TO 110 STEP -110
890 CALL SOUND(200,X,0)
900 CALL HCHAR(CV,CH,104)
910 CALL HCHAR(CV,CH,105)
920 CALL HCHAR(CV,CH,64)
930 NEXT X
940 T=T+1
950 IF L>1 THEN 970
960 GOSUB 1180
970 GOSUB 1250
980 GOSUB 1050
990 GOTO 800
1000 CALL HCHAR(CV,CH,104)
1010 CALL SOUND(50,880,2)
1020 CALL CHAR(104,J$)
1030 CALL CHAR(104,I$)
1040 RETURN
1050 CV=6+INT(RND*9)
1060 CH=5
1070 GOSUB 1830
1080 GOSUB 1000
1090 RETURN
1100 FOR X=1 TO 9
1110 M$(X)="@@@@@@@@@@@@@@@@@@@@@"
1120 FOR Y=1 TO 3+L
1130 Z=RI(19)+1
1140 M$(X)=SEG$(M$(X),1,Z-1)&"#"&SE
     G$(M$(X),Z+1,21)
1150 NEXT Y
1160 NEXT X
1170 RETURN
1180 FOR Y=2 TO 20
1190 FOR X=1 TO 9
1200 IF SEG$(M$(X),Y,1)="@" THEN 12
     20
1210 CALL HCHAR(X+5,Y+5,64)
1220 NEXT X
1230 NEXT Y
1240 RETURN
1250 FOR X=6 TO 26
1260 CALL VCHAR(6,X,96,9)
1270 CALL HCHAR(5,X,59+X)
1280 NEXT X
1290 FOR X=6 TO 14
1300 CALL HCHAR(X,4,43+X)
1310 NEXT X
1320 RETURN
1330 REM  MOVE D,1=N,2=S,3=E,4=W
1340 IF (CV=14)+(D=2)=-2 THEN 1520
1350 IF (CH=5)+(D<>3)=-2 THEN 1520
1360 IF (CV=6)+(D=1)=-2 THEN 1520
1370 CALL HCHAR(CV,CH,32)
1380 ON D GOTO 1390,1420,1450,1490
1390 CV=CV-1
1400 GOSUB 1770
1410 GOTO 1540
1420 CV=CV+1
1430 GOSUB 1800
1440 GOTO 1540
1450 IF CH=27 THEN 1570
1460 CH=CH+1
1470 GOSUB 1830
1480 GOTO 1540
1490 CH=CH-1
1500 GOSUB 1860
1510 GOTO 1540
1520 CALL SOUND(200,-2,0)
1530 RETURN
1540 GOSUB 1000
1550 IF CH=26 THEN 1570
1560 RETURN
1570 REM  WIN!
1580 CALL CLEAR
1590 IF L=2 THEN 1660
1600 PRINT "YOU WON ROUND 1":::"NOW
      LET'S MAKE IT TOUGH!"
1610 PRINT :::"PRESS ANY KEY"
1620 CALL KEY(0,K,S)
1630 IF K*S=0 THEN 1620
1640 L=2
1650 GOTO 750
1660 PRINT :::::"YOU WIN!!!":::"I N
     OW DECLARE YOU":"CHIEF TERMITE
     !"
1670 STOP
1680 CALL KEY(3,K,S)
1690 IF K*S<>0 THEN 1720
1700 GOSUB 1000
1710 GOTO 1680
1720 RETURN
1730 GOSUB 1680
1740 D=POS(K$,CHR$(K),1)
1750 IF D=0 THEN 1730
1760 RETURN
1770 I$="818181818181FF"
1780 J$="E7E7E7E7E7E7FF"
1790 GOTO 1880
1800 I$="FF818181818181"
1810 J$="FFE7E7E7E7E7E7"
1820 GOTO 1880
1830 I$="FFC0C0C0C0C0FF"
1840 J$="FFFFFFC0C0FFFFFF"
1850 GOTO 1880
1860 I$="FF0101010101FF"
1870 J$="FFFFFF0101FFFFFF"
1880 CALL CHAR(104,I$)
1890 RETURN
1900 CALL CLEAR
1910 PRINT "YOU TOOK SO LONG THAT Y
     OUR  TERMITE DIED OF OLD AGE!!
     !!"::::::::::::
1920 STOP
```

21@'s

Advertising in 99'er MAGAZINE

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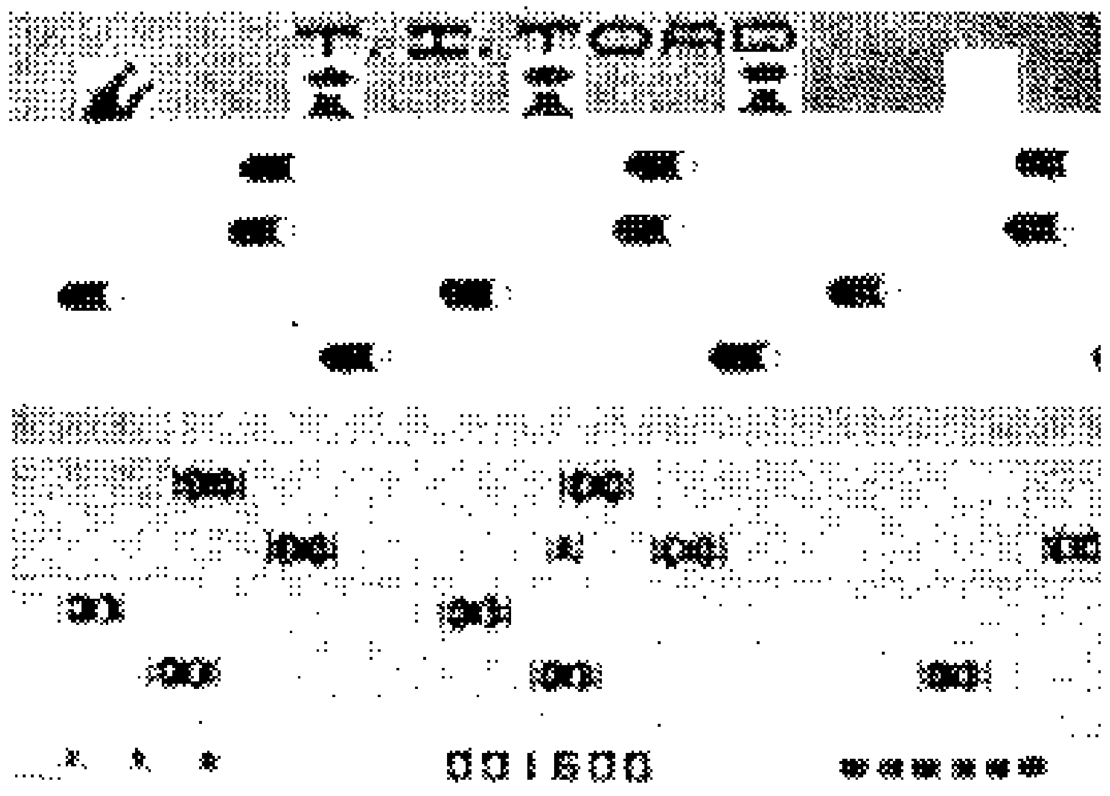
T.I.TOAD



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Gold Rush... from p.46

```
450 P1=INT(RND*15)+5 :: P2=INT(RND*
    28)+1
460 CALL AR(P1,P2,Z,1):: IF Z<4 THE
    N NZ=INT(RND*25)+10 :: CALL AR(
    P1,P2,NZ,2)ELSE GOTO 450
470 NEXT X
480 FOR X=1 TO 30
490 P1=INT(RND*10)+2 :: P2=INT(RND*
    28)+1
500 CALL AR(P1,P2,Z,1):: IF Z<4 THE
    N NZ=INT(RND*15)+10 :: CALL AR(
    P1,P2,NZ,2)ELSE GOTO 490
510 NEXT X
520 CALL CLEAR :: CALL HCHAR(3,1,96
    ,608):: CALL VCHAR(1,31,117,96)
    :: CALL COLOR(12,7,16)
530 CALL CHAR(104,"06E6427E42470D09
    0000001F7FDF0000100B043C3C3C")
540 CALL CHAR(112,"01071C74C4040404
    00000001071C70C000187EC3")
550 CALL CHAR(115,"0000080E0380E03
    80E0382E23202020FFFFFFFFFFFFFF
    F")
560 CALL COLOR(11,13,1):: CALL CHAR
    (120,"1072401A0E604C01CB4259882
    2449908")
570 CALL COLOR(13,13,1):: CALL CHAR
    (128,"7E42427E42427E42"):: CALL
     COLOR(14,5,5)
580 CALL HCHAR(2,24,112):: CALL HCH
    AR(2,28,116):: CALL HCHAR(1,25,
    113)
590 CALL HCHAR(1,26,114):: CALL HCH
    AR(1,27,115)
600 CALL SPRITE(#2,106,2,D1,D2,#3,1
    06,2,D3,D4,#4,106,2,D5,D6,#1,10
    4,13,SM1,SM2)
610 RESTORE 2260 :: GOSUB 2280
620 K=0 :: CALL KEY(0,K,S):: SP1=(S
    M1+7)/8-2 :: SP2=(SM2+7)/8-2
630 DISPLAY AT(23,1):""
640 IF K=69 THEN GOSUB 730 :: GOTO
    620
650 IF K=83 THEN GOSUB 810 :: GOTO
    620
660 IF K=68 THEN GOSUB 900 :: GOTO
    620
670 IF K=88 THEN GOSUB 990 :: GOTO
    620
680 IF K=80 THEN 1050
690 IF K=76 THEN 1140
700 IF K=77 THEN 1810
710 IF K=15 THEN 2200
720 GOTO 620
730 A$=D1$ :: GOSUB 2320
740 IF SP1<1 THEN 770
750 IF SP1=1 THEN 780
760 CALL AR(SP1-1,SP2,Z,1):: IF Z=8
     THEN 780
770 A$=D5$ :: GOSUB 2310 :: RETURN
780 A$=D7$ :: GOSUB 2310 :: SP1=SP1
    -1 :: SM1=SM1-8 :: CALL LOCATE(
    #1,SM1,SM2)
790 IF CAR=1 THEN CALL LOCATE(#CAR1
    ,SM1,SM2)
800 RETURN
810 A$=D2$ :: GOSUB 2320
820 IF SP2=1 THEN 770
830 IF SP1=0 THEN 880
840 CALL AR(SP1,SP2-1,Z,1):: IF Z=7
     OR Z=8 THEN 870
850 IF Z=6 THEN 870
860 A$=D5$ :: GOSUB 2310 :: RETURN
870 IF SP1=19 THEN 880 ELSE CALL AR
    (SP1+1,SP2,Z,1):: IF Z=7 THEN 2
    190
880 SP2=SP2-1 :: SM2=SM2-8 :: CALL
    LOCATE(#1,SM1,SM2):: IF CAR=1 T
    HEN CALL LOCATE(#CAR1,SM1,SM2)
890 RETURN
900 A$=D3$ :: GOSUB 2320
910 IF SP2=28 THEN 770
920 IF SP1=0 THEN 970
930 CALL AR(SP1,SP2+1,Z,1):: IF Z=7
     OR Z=8 THEN 960
940 IF Z=6 THEN 960
950 A$=D5$ :: GOSUB 2310 :: RETURN
960 IF SP1=19 THEN 970 ELSE CALL AR
    (SP1+1,SP2,Z,1):: IF Z=7 THEN 2
    190
970 SP2=SP2+1 :: SM2=SM2+8 :: CALL
    LOCATE(#1,SM1,SM2):: IF CAR=1 T
    HEN CALL LOCATE(#CAR1,SM1,SM2)
980 RETURN
990 A$=D4$ :: GOSUB 2320
1000 IF SP1=19 THEN 770
1010 CALL AR(SP1+1,SP2,Z,1):: IF Z<
     7 OR Z>8 THEN A$=D5$ :: GOSUB
     2310 :: RETURN
1020 IF Z<>8 THEN GOTO 2190
1030 SP1=SP1+1 :: SM1=SM1+8 :: CALL
      LOCATE(#1,SM1,SM2):: IF CAR=1
      THEN CALL LOCATE(#CAR1,SM1,SM
     2)
1040 RETURN
1050 IF CAR=1 THEN 1100 ELSE A$=D6$
      :: GOSUB 2320
1060 IF SM1=D1 AND SM2=D2 THEN CAR=
     1 :: CAR1=2 :: A$=D7$ :: GOSUB
      2310 :: D1,D2=0 :: GOTO 620
1070 IF SM1=D3 AND SM2=D4 THEN CAR=
     1 :: CAR1=3 :: A$=D7$ :: GOSUB
      2310 :: D3,D4=0 :: GOTO 620
1080 IF SM1=D5 AND SM2=D6 THEN CAR=
     1 :: CAR1=4 :: A$=D7$ :: GOSUB
      2310 :: D5,D6=0 :: GOTO 620
1090 A$=D8$ :: GOSUB 2310 :: GOTO 6
     20
1100 A$=D9$ :: GOSUB 2320
1110 IF CAR1=2 THEN D1=SM1 :: D2=SM
     2 :: CAR=0 :: GOTO 620
1120 IF CAR1=3 THEN D3=SM1 :: D4=SM
     2 :: CAR=0 :: GOTO 620
1130 IF CAR1=4 THEN D5=SM1 :: D6=SM
     2 :: CAR=0 :: GOTO 620
1140 A$=D10$ :: GOSUB 2320 :: A$=D1
     1$ :: GOSUB 2310
1150 IF CAR=0 OR DC(CAR1)=0 THEN A$
     =D12$ :: GOSUB 2310 :: GOTO 62
     0
1160 GOSUB 2330
1170 IF K=83 THEN 1210
1180 IF K=68 THEN 1260
1190 IF K=88 THEN 1290
1200 CALL SOUND(100,550,0):: GOTO 1
     160
```

Continued on p. 50

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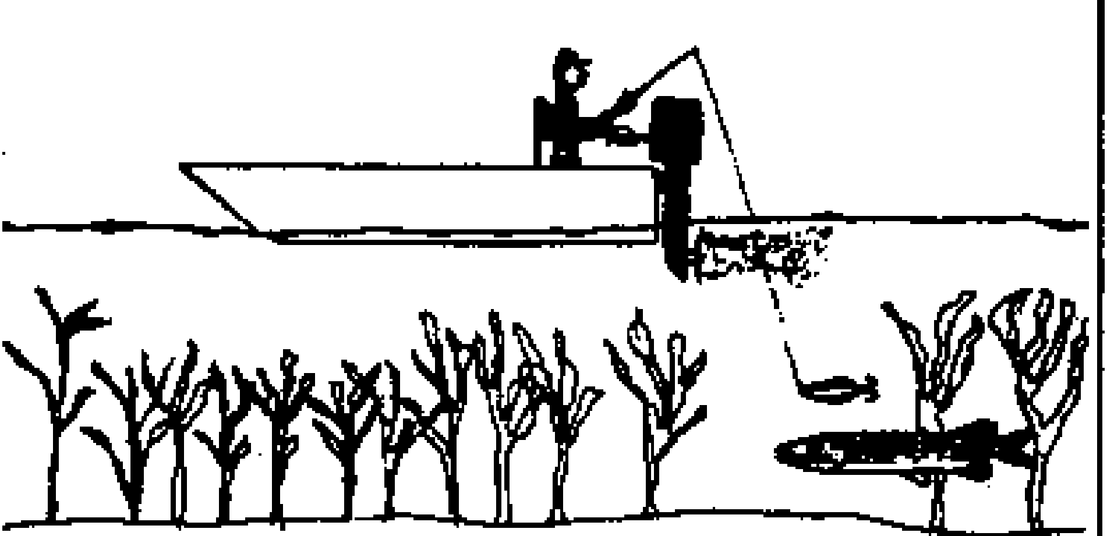

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Gold Rush...from p.49

```
1210 IF SP2<2 THEN A$=D13$ :: GOSUB
      2310 :: GOTO 620
1220 CALL AR(SP1,SP2-1,Z,1):: IF Z=
     7 OR Z=8 THEN A$=D13$ :: GOSUB
      2310 :: GOTO 620
1230 CALL SPRITE(#5,105,7,SM1,SM2-8
     ):: DC(CAR1)=DC(CAR1)-1
1240 P1=SP1 :: P2=SP2-1
1250 A$=D14$ :: GOSUB 2310 :: GOTO
     1320
1260 IF SP2>27 THEN A$=D13$ :: GOSU
     B 2310 :: GOTO 620
1270 CALL AR(SP1,SP2+1,Z,1):: IF Z=
     7 OR Z=8 THEN A$=D13$ :: GOSUB
      2310 :: GOTO 620
1280 CALL SPRITE(#5,105,7,SM1,SM2+8
     ):: DC(CAR1)=DC(CAR1)-1 :: P1=
     SP1 :: P2=SP2+1 :: GOTO 1250
1290 IF SP1>18 THEN A$=D13$ :: GOSU
     B 2310 :: GOTO 620
1300 CALL AR(SP1+1,SP2,Z,1):: IF Z=
     7 OR Z=8 THEN A$=D13$ :: GOSUB
      2310 :: GOTO 620
1310 CALL SPRITE(#5,105,7,SM1+8,SM2
     ):: DC(CAR1)=DC(CAR1)-1 :: P1=
     SP1+1 :: P2=SP2 :: GOTO 1250
1320 TD=5
1330 DISPLAY AT(22,17):TD :: GOSUB
     1750
1340 TD=TD-1 :: IF TD>-1 THEN 1330
1350 FOR EX=1 TO 10 :: CALL PATTERN
     (#5,120):: CALL PATTERN(#5,121
     ):: CALL SOUND(500,INT(RND*-3)
     -4,0):: NEXT EX
1360 CALL DELSPRITE(#5):: IF ABS(SP
     1-P1)<3 AND ABS(SP2-P2)<3 THEN
      1740
1370 CALL AR(P1,P2,Z,1):: ORE=Z
1380 IF K<>88 THEN 1400 ELSE CALL H
     CHAR(P1+2,P2+2,128):: CALL AR(
     P1,P2,8,2)
1390 CALL HCHAR(P1+1,P2+2,128):: CA
     LL AR(P1-1,P2,8,2):: GOTO 1410
1400 CALL HCHAR(P1+2,P2+2,32):: CAL
     L AR(P1,P2,7,2)
1410 IF ORE<4 THEN A$=D15$ :: GOSUB
      2310 :: GOTO 620
1420 IF ORE>8 THEN GOLD=GOLD+ORE ::
      DISPLAY AT(24,21):GOLD :: A$=
     D16$ :: GOSUB 2310 :: DISPLAY
     AT(22,24):ORE
1430 IF ORE<=8 THEN 1450
1440 RESTORE 2270 :: FOR CS=1 TO 5
     :: READ GS :: CALL SOUND(200*C
     S,GS,0):: NEXT CS :: GOTO 620
1450 IF ORE=4 THEN A$=D17$ :: GOSUB
      2310 :: GOTO 620
1460 CALL HCHAR(P1+2,P2+2,136)
1470 A$=D21$ :: GOSUB 2310 :: CALL
     SOUND(1000,110,0,-8,0):: GOSUB
      1750
1480 CALL SOUND(500,110,0,-5,0):: G
     OSUB 1750
1490 IF P2<=1 THEN 1500 ELSE CALL A
     R(P1,P2-1,Z,1):: IF Z=7 OR Z=8
      THEN 1520
1500 IF P2>27 THEN 1510 ELSE CALL A
     R(P1,P2+1,Z,1):: IF Z=8 OR Z=7
      THEN 1580
1510 CALL HCHAR(P1+2,P2+2,136):: GO
     TO 620
1520 P2=P2-1 :: CALL HCHAR(P1+2,P2+
     2,136):: GOSUB 1750
1530 CALL AR(P1,P2,5,2)
1540 IF P1=SP1 AND P2=SP2 THEN 2190
1550 IF P1=19 THEN 1560 ELSE CALL A
     R(P1+1,P2,Z,1):: IF Z=8 THEN G
     OTO 1640
1560 IF P2>0 THEN CALL AR(P1,P2-1,Z
     ,1):: IF Z=7 OR Z=8 THEN 1520
1570 CALL HCHAR(P1+2,P2+2,136):: GO
     TO 620
1580 P2=P2+1 :: CALL HCHAR(P1+2,P2+
     2,136):: GOSUB 1750
1590 CALL AR(P1,P2,5,2)
1600 IF P1=SP1 AND P2=SP2 THEN 2190
1610 IF P1=19 THEN 1620 ELSE CALL A
     R(P1+1,P2,Z,1):: IF Z=8 THEN G
     OTO 1640
1620 IF P2<28 THEN CALL AR(P1,P2+1,
     Z,1):: IF Z=7 OR Z=8 THEN 1580
1630 CALL HCHAR(P1+2,P2+2,136):: GO
     TO 620
1640 P1=P1+1 :: CALL HCHAR(P1+2,P2+
     2,136):: GOSUB 1750
1650 CALL AR(P1,P2,5,2)
1660 IF P1=SP1 AND P2=SP2 THEN 2190
1670 IF P1=19 THEN 1680 ELSE CALL A
     R(P1+1,P2,Z,1):: IF Z=8 THEN 1
     640
1680 RANDOMIZE
1690 IF P2>27 OR P2<=1 THEN 1720
1700 CALL AR(P1,P2+1,Z,1):: CALL AR
     (P1,P2-1,Z1,1):: IF (Z=7 OR Z=
     8)AND(Z1=7 OR Z1=8)THEN FL3=IN
     T(RND*2)+1
1710 IF FL3>0 THEN ON FL3 GOTO 1520
     ,1580
1720 IF Z=7 OR Z=8 THEN 1580 ELSE I
     F Z1=7 OR Z1=8 THEN 1520
1730 CALL HCHAR(P1+2,P2+2,136):: GO
     TO 620
1740 DISPLAY AT(22,1):D22$:D23$ ::
     GOTO 2200
1750 CALL KEY(0,K1,S1):: IF S1=0 OR
      S=-1 THEN RETURN
1760 IF K1=69 THEN GOSUB 730 :: RET
     URN
```

Continued on p. 51

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```
1770 IF K1=83 THEN GOSUB 810 :: RET
     URN
1780 IF K1=68 THEN GOSUB 900 :: RET
     URN
1790 IF K1=88 THEN GOSUB 990 :: RET
     URN
1800 RETURN
1810 DISPLAY AT(23,1):"MINE IN WHAT
      DIRECTION?"
1820 CALL KEY(0,KE,SE):: IF SE=0 TH
     EN 1820
1830 IF KE=83 THEN 1870
1840 IF KE=68 THEN 1970
1850 IF KE=88 THEN 2070
1860 CALL SOUND(100,550,0):: GOTO 1
     810
1870 DISPLAY AT(24,1)SIZE(16):"MINE
      LEFT"
1880 IF SP2<2 OR SP1<1 THEN CALL SO
     UND(50,220,5):: GOTO 620
1890 CALL AR(SP1,SP2-1,Z,1):: IF Z<
     >1 THEN 1920 ELSE CALL AR(SP1,
     SP2-1,7,2):: CALL HCHAR(SP1+2,
     SP2+1,32)
1900 SM2=SM2-8 :: SP2=SP2-1 :: CALL
      LOCATE(#1,SM1,SM2):: IF CAR=1
      THEN CALL LOCATE(#CAR1,SM1,SM
     2)
1910 A$=D18$ :: GOSUB 2310 :: GOTO
     620
1920 IF Z=2 THEN A$=D19$ :: GOSUB 2
     310 :: GOTO 620
1930 IF Z=3 THEN A$=D20$ :: GOSUB 2
     310 :: GOTO 620
1940 IF Z=7 OR Z=8 THEN DISPLAY AT(
     22,1):"ALREADY MINED." :: GOTO
      620
1950 CALL HCHAR(SP1+2,SP2+1,32):: O
     RE=Z :: IF Z>8 THEN CALL AR(SP
     1,SP2-1,7,2)
1960 P1=SP1 :: P2=SP2-1 :: GOTO 142
     0
1970 DISPLAY AT(24,1)SIZE(16):"MINE
      RIGHT"
1980 IF SP2>27 OR SP1<1 THEN CALL S
     OUND(50,220,5):: GOTO 620
1990 CALL AR(SP1,SP2+1,Z,1):: IF Z<
     >1 THEN 2020 ELSE CALL AR(SP1,
     SP2+1,7,2):: CALL HCHAR(SP1+2,
     SP2+3,32)
2000 SM2=SM2+8 :: SP2=SP2+1 :: CALL
      LOCATE(#1,SM1,SM2):: IF CAR=1
      THEN CALL LOCATE(#CAR1,SM1,SM
     2)
2010 A$=D18$ :: GOSUB 2310 :: GOTO
     620
2020 IF Z=2 THEN A$=D18$ :: GOSUB 2
     310 :: GOTO 620
2030 IF Z=3 THEN A$=D19$ :: GOSUB 2
     310 :: GOTO 620
2040 IF Z=7 OR Z=8 THEN DISPLAY AT(
     22,1):"ALREADY MINED." :: GOTO
      620
2050 CALL HCHAR(SP1+2,SP2+3,32):: O
     RE=Z :: IF Z>8 THEN CALL AR(SP
     1,SP2+1,7,2)
2060 P1=SP1 :: P2=SP2+1 :: GOTO 142
     0
2070 DISPLAY AT(24,1)SIZE(16):"MINE
      DOWN."
2080 IF SP1=19 THEN CALL SOUND(50,2
     20,5):: GOTO 620
2090 CALL AR(SP1+1,SP2,Z,1):: IF Z<
     >1 THEN 2130 ELSE CALL AR(SP1+
     1,SP2,8,2):: CALL HCHAR(SP1+3,
     SP2+2,128)
2100 SP1=SP1+1 :: SM1=SM1+8 :: CALL
      LOCATE(#1,SM1,SM2):: IF CAR=1
      THEN CALL LOCATE(#CAR1,SM1,SM
     2)
2110 A$=D18$ :: GOSUB 2310 :: IF SP
     1<1 THEN GOTO 620
2120 CALL AR(SP1-1,SP2,8,2):: CALL
     HCHAR(SP1+1,SP2+2,128):: GOTO
     620
2130 IF Z=2 THEN A$=D19$ :: GOSUB 2
     310 :: GOTO 620
2140 IF Z=3 THEN A$=D20$ :: GOSUB 2
     310 :: GOTO 620
2150 IF Z=7 THEN CALL AR(SP1+1,SP2,
     8,2):: CALL HCHAR(SP1+3,SP2+2,
     128):: GOTO 620
2160 IF Z=8 THEN DISPLAY AT(22,1):"
     ALREADY MINED" :: GOTO 620
2170 CALL VCHAR(SP1+2,SP2+2,128,2):
     : ORE=Z :: IF Z>8 THEN CALL AR
     (SP1+1,SP2,8,2):: CALL AR(SP1,
     SP2,8,2)
2180 P1=SP1+1 :: P2=SP2 :: GOTO 142
     0
2190 DISPLAY AT(22,1):"YOUR DEAD!"
     :: CALL SOUND(2000,220,0):: CA
     LL SOUND(4000,110,0)
2200 CALL DELSPRITE(ALL):: DISPLAY
     AT(23,13):"SCORE:";GOLD :: DIS
     PLAY AT(24,1):"PLAY AGAIN(Y/N)
     ?"
2210 ACCEPT AT(24,17)VALIDATE("YN")
     :PA$ :: IF PA$="Y" THEN SCORE=
     0 :: CAR=0 :: GOTO 160 ELSE CA
     LL CLEAR :: STOP
2220 DATA 2,9,GOLD RUSH,4,5,BY W. K
     . BALTHROP,24,1,PRESS ANY KEY
     TO BEGIN
2230 DATA 12,7,STANDBY PLEASE
2240 DATA 1,1,LEVEL OF DIFFICULTY:,
     3,3,1.MINE COOK,5,3,2.MINER'S
     HELPER,7,3,3.APPRENTICE MINER,
     9,3,4.MINER
```

Continued on p. 64

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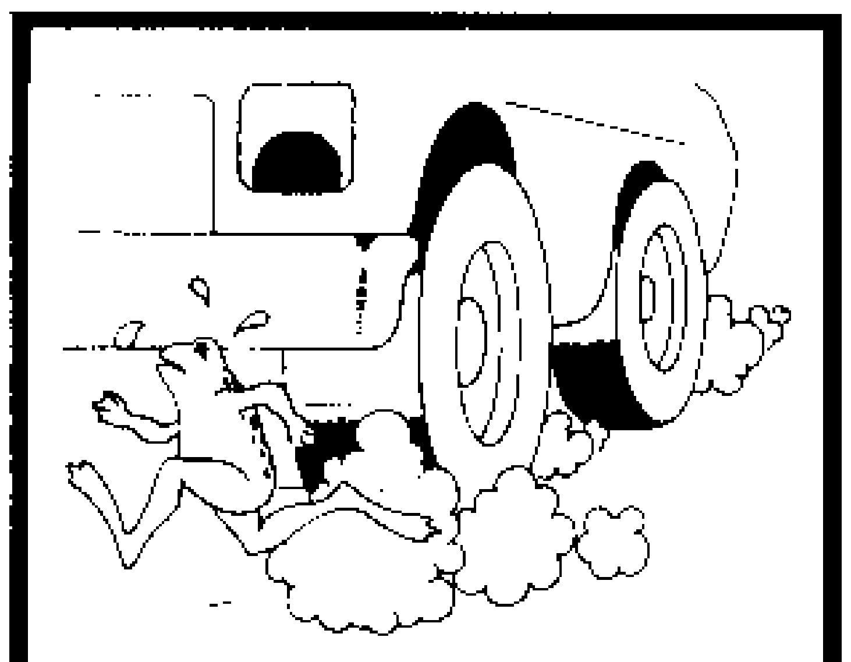

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TEX- *Scribe* **. . . from p.17**

```
920 L_PROMPT$=STR$(B)
930 GOSUB 2890
940 L=L+1
950 FOR I=L TO B+1 STEP -1
960 A$(I)=A$(I-1)
970 NEXT I
980 A$(B)=INPUT$
990 PRINT :"Line added, file renumb
    ered": :
1000 RETURN
1010 REM --- REPLACE A LINE
1020 REM
1030 CALL SCREEN(10)
1040 IF L>0 THEN 1070
1050 PRINT :" *** FILE EMPTY ***":
1060 GOTO 1150
1070 PRINT :"Replace"
1080 GOSUB 3030
1090 IF B=0 THEN 1150
1100 PRINT :"Enter replacement line
     -":
1110 L_PROMPT$=STR$(B)
1120 GOSUB 2890
1130 A$(B)=INPUT$
1140 PRINT :"Line replaced": :
1150 RETURN
1160 REM --- CLEAR FILE IN MEMORY
1170 FOR I=1 TO L
1180 A$(I)=""
1190 NEXT I
1200 L=0
1210 PRINT : :"-- MEMORY WORK AREA
     CLEARED": :
1220 RETURN
1230 REM --- ADD LINES TO FILE
1240 REM
1250 CALL SCREEN(16)
1260 REM
1270 REM
1280 CALL CLEAR
1290 PRINT : : :"--- Ready for typi
     ng ---          (enter ^^ to exi
     t)": :
1300 L_PROMPT$=STR$(L+1)
1310 GOSUB 2890
1320 IF LEN(INPUT$)<>4 THEN 1340
1330 IF SEG$(INPUT$,1,2)="^^" THEN
     1370
1340 L=L+1
1350 A$(L)=INPUT$
1360 GOTO 1300
1370 RETURN
1380 REM --- SAVE FILE
1390 REM
1400 CALL SCREEN(12)
1410 IF L>0 THEN 1440
1420 PRINT : :" *** FILE EMPTY ***"
     : :
1430 GOTO 1570
1440 PRINT : :"Enter range of file
     to save.": :
1450 GOSUB 3160
1460 PRINT
1470 INPUT "SAVE to
             1=cassette  2=disk:":DEV
1480 IF DEV<>1 THEN 1510
1490 GOSUB 3450
1500 GOTO 1570
1510 IF DEV<>2 THEN 1540
1520 GOSUB 3650
1530 GOTO 1570
1540 PRINT
1550 CALL SOUND(500,220,1,659,1)
1560 GOTO 1470
1570 RETURN
1580 REM --- LIST FILE SOURCE
1590 REM
1600 CALL SCREEN(6)
1610 PRINT :"Enter the range of fil
     e      source lines to print-":
1620 GOSUB 3160
1630 PRINT : : :
1640 INPUT "Output to screen or pri
     nter?         (P/S)":P$
1650 PRINT : : :
1660 IF (P$="P")+(P$="p")=-1 THEN 1
     730
1670 FOR I=A TO B
1680 S=I
1690 GOSUB 2740
1700 PRINT I;S$
1710 NEXT I
1720 GOTO 1930
1730 PRINT : : :" *** PRINTING SOUR
     CE ***": : :
1740 REM $$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$
1750 OPEN #1:"RS232.DA=8.BA=9600",V
     ARIABLE 132
1760 REM $$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$
1770 PRINT #1:RESET@EPSON$
1780 REM $$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$
1790 REM == PUT PRINTER IN CONDENSE
     D PRINT MODE ==
1800 REM $$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$
1810 PRINT #1:CHR$(15)
1820 REM $$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$
1830 FOR I=A TO B
1840 S=I
1850 GOSUB 2740
1860 PRINT #1:I;S$
1870 NEXT I
1880 REM  == PUT PRINTER BACK TO NO
     RMAL ==
```

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```

Tex-Scribe

```
1890 REM $$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$
1900 PRINT #1:CHR$(18)
1910 REM $$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$
1920 CLOSE #1
1930 RETURN
1940 REM --- LOAD A FILE
1950 REM
1960 CALL SCREEN(12)
1970 IF L=0 THEN 2090
1980 CALL SOUND(500,220,1,659,1)
1990 PRINT : : :"*** FILE HAS DATA
     ALREADY         IN IT.":
2000 PRINT " Enter ""C"" to CLEAR f
     ile     Enter ""M"" to MERGE n
     ew file"
2010 INPUT CH$
2020 IF (CH$="C")+(CH$="c")=0 THEN
     2050
2030 GOSUB 1160
2040 GOTO 2090
2050 IF (CH$="M")+(CH$="m")=-1 THEN
      2090
2060 CALL SOUND(500,220,1,659,1)
2070 PRINT
2080 GOTO 2000
2090 PRINT
2100 INPUT "LOAD/MERGE from:
          1=cassette  2=disk   -?"
     :DEV
2110 IF DEV<>1 THEN 2140
2120 GOSUB 3360
2130 GOTO 2200
2140 IF DEV<>2 THEN 2170
2150 GOSUB 3540
2160 GOTO 2200
2170 CALL SOUND(500,220,1,659,1)
2180 PRINT
2190 GOTO 2100
2200 RETURN
2210 REM --- REPLACE A STRING
2220 REM
2230 CALL SCREEN(10)
2240 PRINT :"String to be replaced"
2250 L_PROMPT$="?"
2260 GOSUB 2890
2270 R$=SEG$(INPUT$,1,(LEN(INPUT$)-
     2))
2280 D=LEN(R$)
2290 IF D>0 THEN 2320
2300 PRINT :"CAN'T REPLACE NULL STR
     ING": :
2310 RETURN
2320 N=0
2330 PRINT :"Enter replacement stri
     ng"
2340 GOSUB 2890
2350 N$=SEG$(INPUT$,1,(LEN(INPUT$)-
     2))
2360 PRINT :"Enter search range."
2370 GOSUB 3160
2380 PRINT : :" *** SEARCHING ***":
      :
2390 FOR K=A TO B
2400 IF LEN(A$(K))<D THEN 2510
2410 CPOS=POS(A$(K),R$,1)
2420 IF CPOS=0 THEN 2510
2430 T$(1)=SEG$(A$(K),1,CPOS-1)
2440 T$(2)=SEG$(A$(K),CPOS+D,132)
2450 A$(K)=T$(1)&N$&T$(2)
2460 N=N+1
2470 PRINT "Changed line";K;"to-"
2480 S=K
2490 GOSUB 2740
2500 PRINT S$:
2510 NEXT K
2520 PRINT : :N;"changes made.": :
2530 RETURN
2540 REM --- PRINT TEXT FROM FILE
2550 REM
2560 CALL SCREEN(6)
2570 PRINT :"Enter line range to pr
     int-":
2580 GOSUB 3160
2590 PRINT : :"  ***  PRINTING TEXT
      ***": :
2600 REM $$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$
2610 OPEN #1:"RS232.DA=8.BA=9600.CR
     .LF",VARIABLE 132
2620 REM $$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$
2630 REM
2640 REM $$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$
2650 PRINT #1:RESET@EPSON$
2660 REM $$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
     $$$$$$
2670 REM
2680 FOR I=A TO B
2690 PRINT #1:A$(I)
2700 NEXT I
2710 CLOSE #1
2720 REM
2730 RETURN
2740 REM --- FORMAT SOURCE OUTPUT
2750 REM
2760 S$=A$(S)
2770 LS=LEN(S$)
2780 FOR O=1 TO LS
2790 P=ASC(SEG$(A$(S),O,1))+1
2800 IF P<33 THEN 2830
2810 IF P<130 THEN 2870
2820 P=P-128
```

Continued on p. 54

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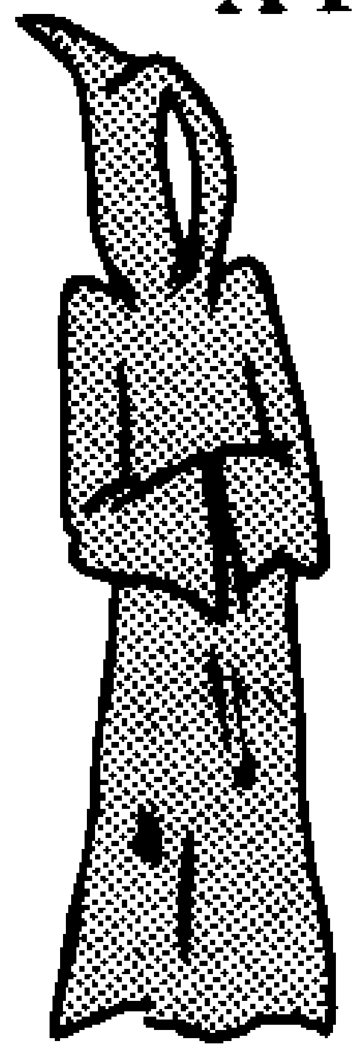

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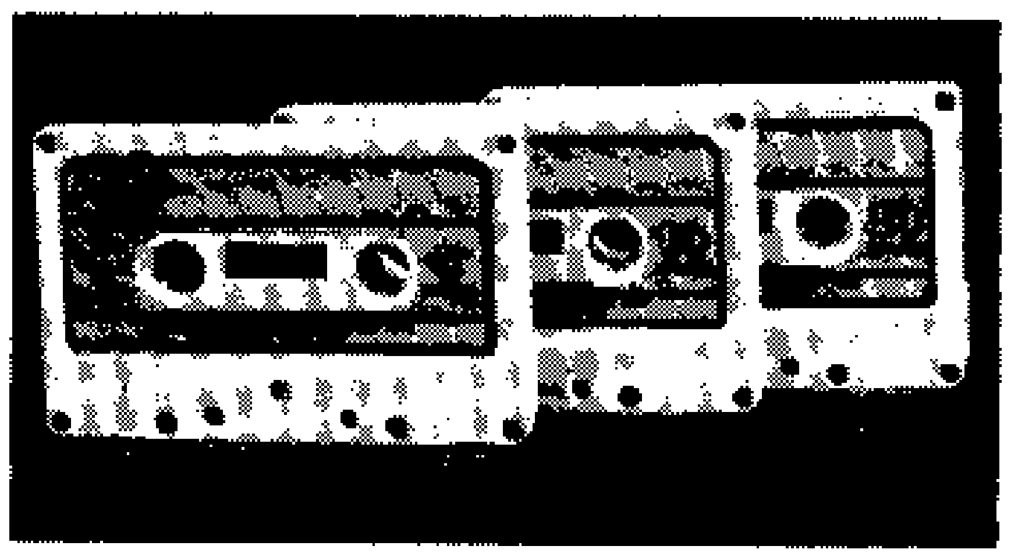

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Tex-Scribe...from p.53

```
2830 TS=LEN(S$)
2840 LM=LS-O
2850 PM=TS-LM
2860 S$=SEG$(S$,1,(PM-1))&C$(P)&SEG
     $(S$,(PM+1),LM)
2870 NEXT O
2880 RETURN
2890 REM --- INPUT FROM KEYBOARD
2900 REM
2910 INPUT$=""
2920 LINPUT L_PROMPT$&"-":INPUT$
2930 IF LEN(INPUT$)<WIDTH THEN 3010
2940 PRINT :"*** LINE TOO LONG ***"
     : :
2950 CALL SOUND(500,220,1,659,1)
2960 FOR W=WIDTH TO 1 STEP -1
2970 IF SEG$(INPUT$,W,1)=" " THEN 2
     990
2980 NEXT W
2990 INPUT$=SEG$(INPUT$,1,W)
3000 PRINT L_PROMPT$&"-"&INPUT$
3010 INPUT$=INPUT$&LFCR$
3020 RETURN
3030 REM --- FIND AND DISPLAY LINE
     SUBROUTINE
3040 REM
3050 PRINT
3060 INPUT "Line number?":B
3070 IF (B>-1)+(B<(L+1))=-2 THEN 31
     00
3080 PRINT : :" *** NO SUCH LINE **
     *": :
3090 GOTO 3060
3100 IF B=0 THEN 3150
3110 PRINT :"Old line";B;"reads -":
      :
3120 S=B
3130 GOSUB 2760
3140 PRINT S$
3150 RETURN
3160 REM ---GET RANGE SUBROUTINE
3170 REM
3180 PRINT "The last line in file i
     s";L:
3190 PRINT :"Enter the first line n
     umber,"
3200 INPUT "(Enter zero for whole f
     ile):":A
3210 IF A>0 THEN 3250
3220 A=1
3230 B=L
3240 GOTO 3350
3250 IF (A>0)+(A<L+1)=-2 THEN 3280
3260 PRINT :" *** NUMBER OUT OF RAN
     GE ***": :
3270 GOTO 3180
3280 PRINT
3290 INPUT "Enter the last line num
     ber:":B
3300 IF B>A THEN 3330
3310 B=A
3320 GOTO 3350
3330 IF B<L THEN 3350
3340 B=L
3350 RETURN
3360 REM --- CASSETTE LOAD SUBROUTI
     NE
3370 REM
3380 OPEN #1:"CS1",INTERNAL,INPUT ,
     FIXED 192
3390 INPUT #1:X :: LL=L
3400 FOR I=LL+1 TO X+LL
3410 INPUT #1:A$(I):: L=L+1
3420 NEXT I
3430 CLOSE #1
3440 RETURN
3450 REM --- CASSETTE SAVE SUBROUTI
     NE
3460 REM
3470 OPEN #1:"CS1",INTERNAL,OUTPUT,
     FIXED 192
3480 PRINT #1:((B+1)-A)
3490 FOR I=A TO B
3500 PRINT #1:A$(I)
3510 NEXT I
3520 CLOSE #1
3530 RETURN
3540 REM --- DISK LOAD SUBROUTINE
3550 REM
3560 GOSUB 3750
```

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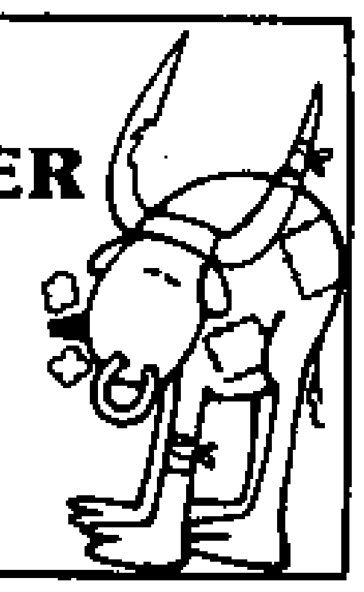
```
3570 OPEN #1:"DSK"&STR$(DISK)&"."&F
     ILE$,INPUT ,SEQUENTIAL,INTERNA
     L,VARIABLE 254
3580 INPUT #1:X
3590 LL=L
3600 FOR I=LL+1 TO X+LL
3610 INPUT #1:A$(I):: L=L+1
3620 NEXT I
3630 CLOSE #1
3640 RETURN
3650 REM --- DISK SAVE SUBROUTINE
3660 REM
3670 GOSUB 3750
3680 OPEN #1:"DSK"&STR$(DISK)&"."&F
     ILE$,OUTPUT,SEQUENTIAL,INTERNA
     L,VARIABLE 254
3690 PRINT #1:((B+1)-A)
3700 FOR I=A TO B
3710 PRINT #1:A$(I)
3720 NEXT I
3730 CLOSE #1
3740 RETURN
3750 REM --- DISK FILE SELECT SUBRO
     UTINE
3760 REM
3770 PRINT
3780 INPUT "Which disk 1,2, or 3?":
     DISK
3790 IF (DISK<1)+(DISK>3)=0 THEN 38
     30
3800 PRINT
3810 CALL SOUND(500,220,1,659,1)
3820 GOTO 3780
3830 PRINT : :"ENGAGE ""ALPHA LOCK
     KEY""      Then enter file name
      of 1-10"
3840 INPUT "characters:":FILE$
3850 IF (LEN(FILE$)<1)+(LEN(FILE$)>
     10)=0 THEN 3890
3860 PRINT
3870 CALL SOUND(500,220,1,659,1)
3880 GOTO 3830
3890 RETURN
3900 REM --- ERROR HANDLING AND REC
     OVERY SUBROUTINE
3910 REM
3920 ON ERROR 3980 :: CALL ERR(ECOD
     E,ZAP)
3930 CALL SOUND(500,110,1,220,1,659
     ,1)
3940 IF ECODE=39 OR ECODE=40 THEN 3
     950 ELSE 3960
3950 A$(L)="" :: A$(L-1)="" :: A$(L
     -2)="" :: A$(L-3)="" :: A$(L-4
     )="" :: L=L-4 :: PRINT : :MEM$
      :: GOTO 4000
3960 IF ECODE>82 AND ECODE<131 THEN
      PRINT : :"<<< SORRY, I/O ERRO
     R >>>" :: GOTO 4000
3970 PRINT : :"<<< WEIRDO ERROR @#%
     ! >>>" :: GOTO 4000
3980 CALL ERR(ECODE,ZAP,ZIP,SPOT)
3990 PRINT "ERROR";ECODE;"IN LINE";
     SPOT
4000 ON ERROR 4020
4010 CLOSE #1 :: GOTO 4030
4020 CALL ERR(ECODE,ZAP)
4030 RETURN 580
4040 CALL CLEAR
```



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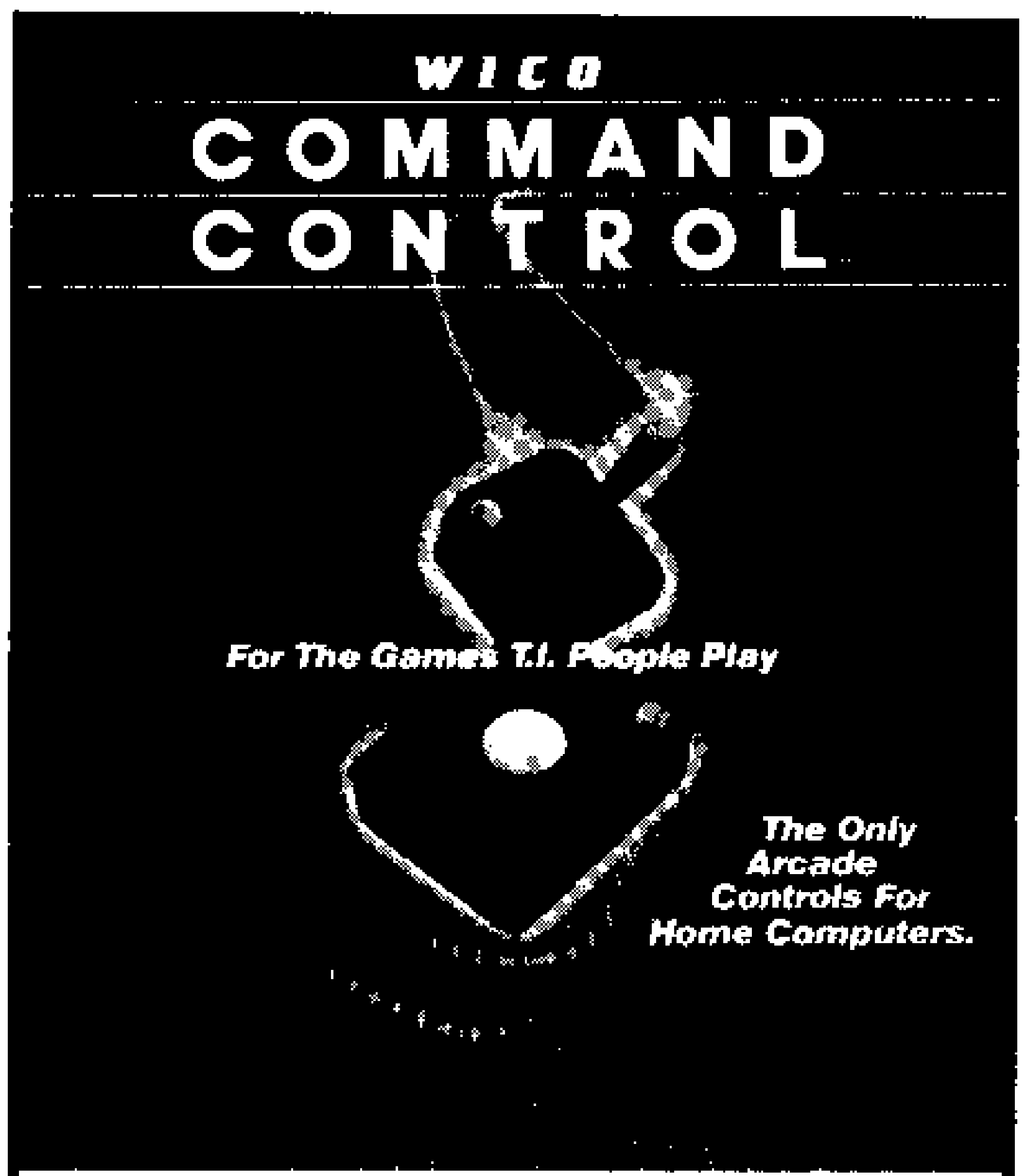
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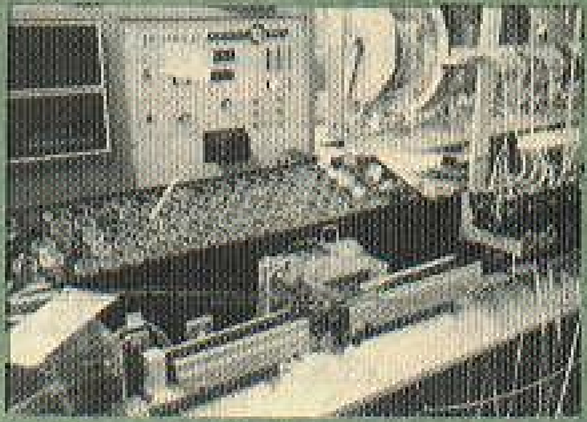
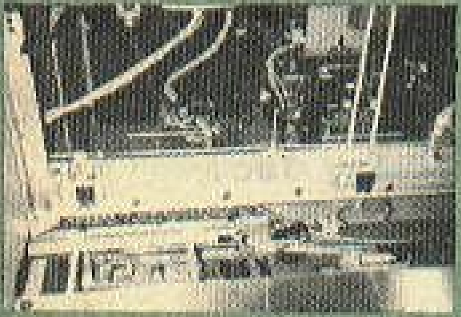
SANTA'S WORKSHOP
The Making of a Home Computer

1. Santa's auxiliary workshop (Texas branch). . .

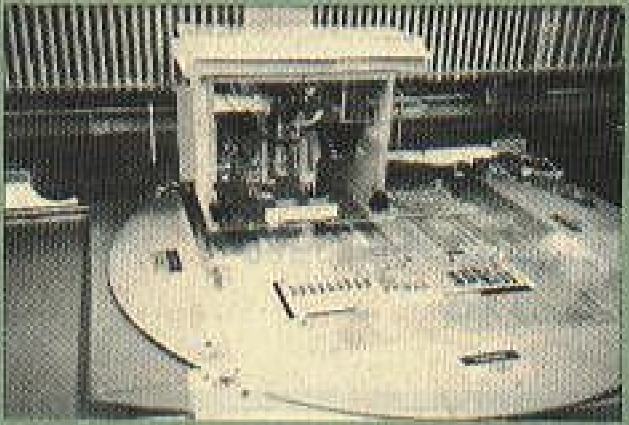
2. Once inside, our Elfin guide leads us down a half-mile hallway to the start of the Home Computer production line.



3. Here, each little component is carefully tested by a big computer before it becomes part of a Home Computer.



4. Santa uses many computerized tools in this huge workshop (Elves can't do *everything*). Here the wires of the smallest parts are pushed into circuit boards.

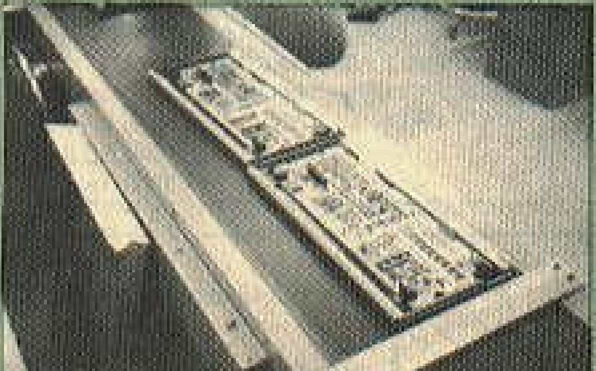


5. Another robot inserts the wire leads of some larger parts in the printed circuit boards.

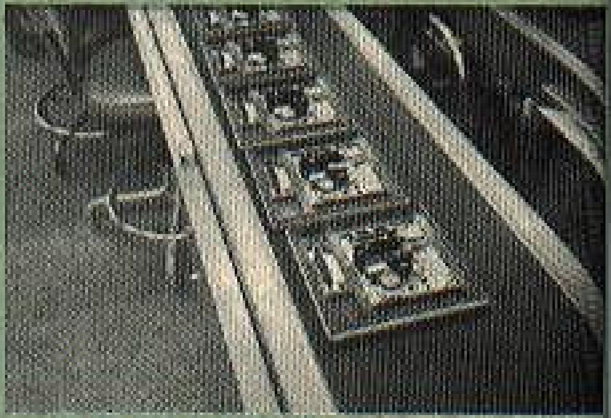
6. Not all Santa's helpers are robots. . .

7. Look at all the people! Each one is putting parts in either the main or the power supply printed circuit boards.

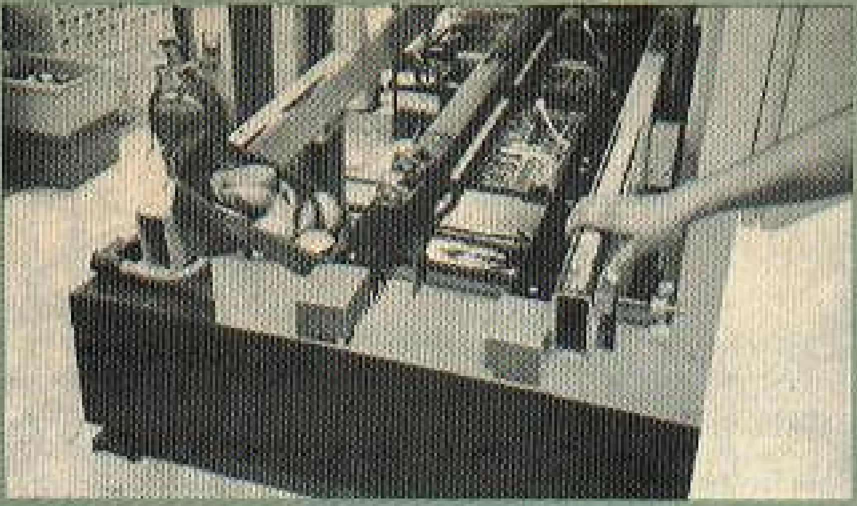
8. The end of the line. All the parts are in place, ready for soldering.



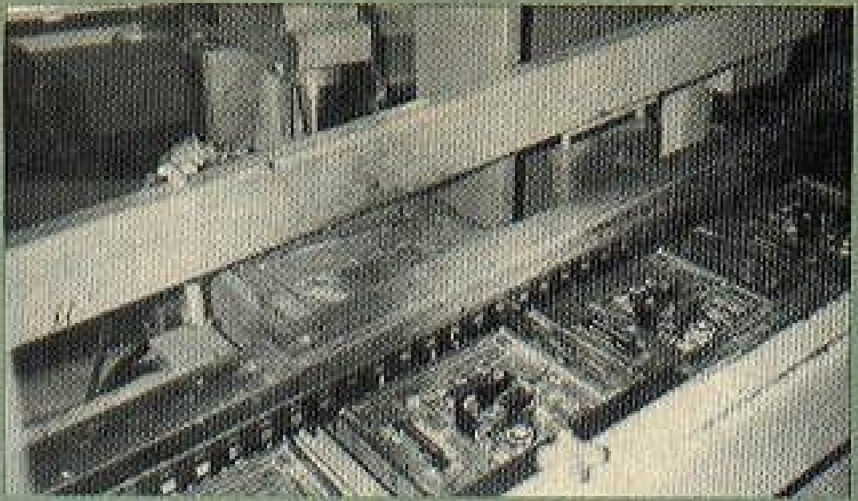
9. The main boards for the computer's circuitry, are ready for the "flow soldering" machine.



10. The power supply circuit boards are ready too!



11. The boards go onto the moving rack of the huge soldering machine.



12. Now the boards pass over a hot river of solder, and all connections are made simultaneously!

13. After the "metal river" ride, all boards receive a bath (to remove solder flux).

14. Talk about being pampered! After their bath, these lucky boards are individually dried. . .

15. With even more "TLC," they are treated to a thorough check with a hand soldered touch-up, if needed.

16. Now is the time to plug in the main computer "chips" including the "giant" TMS9900 microprocessor chip.

17. Santa's helpers test the main board for open or shorted connections.

18. The main printed circuit board is now powered up for the first time.

19. At the same time, the power supply printed circuit board is tested separately. . .

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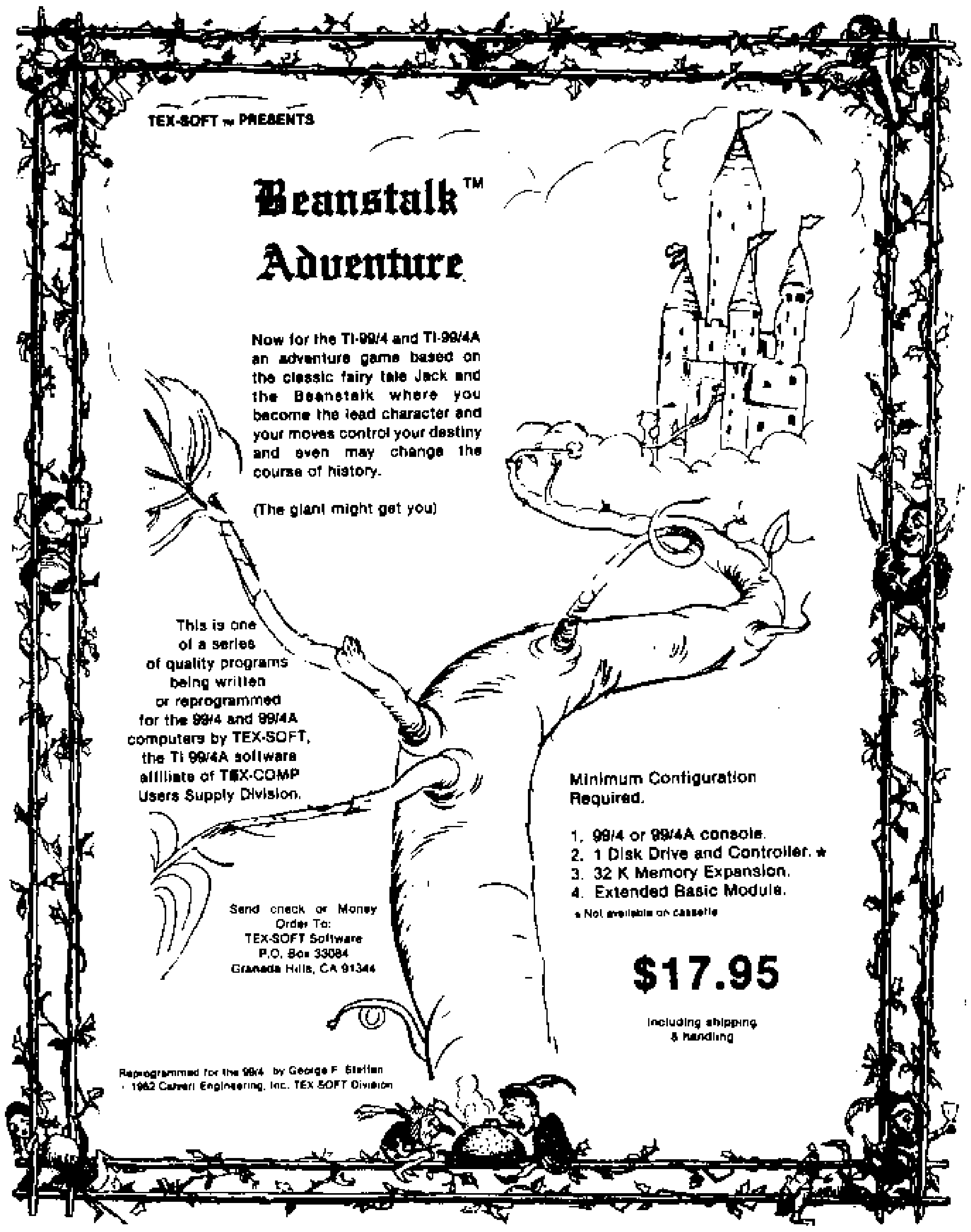

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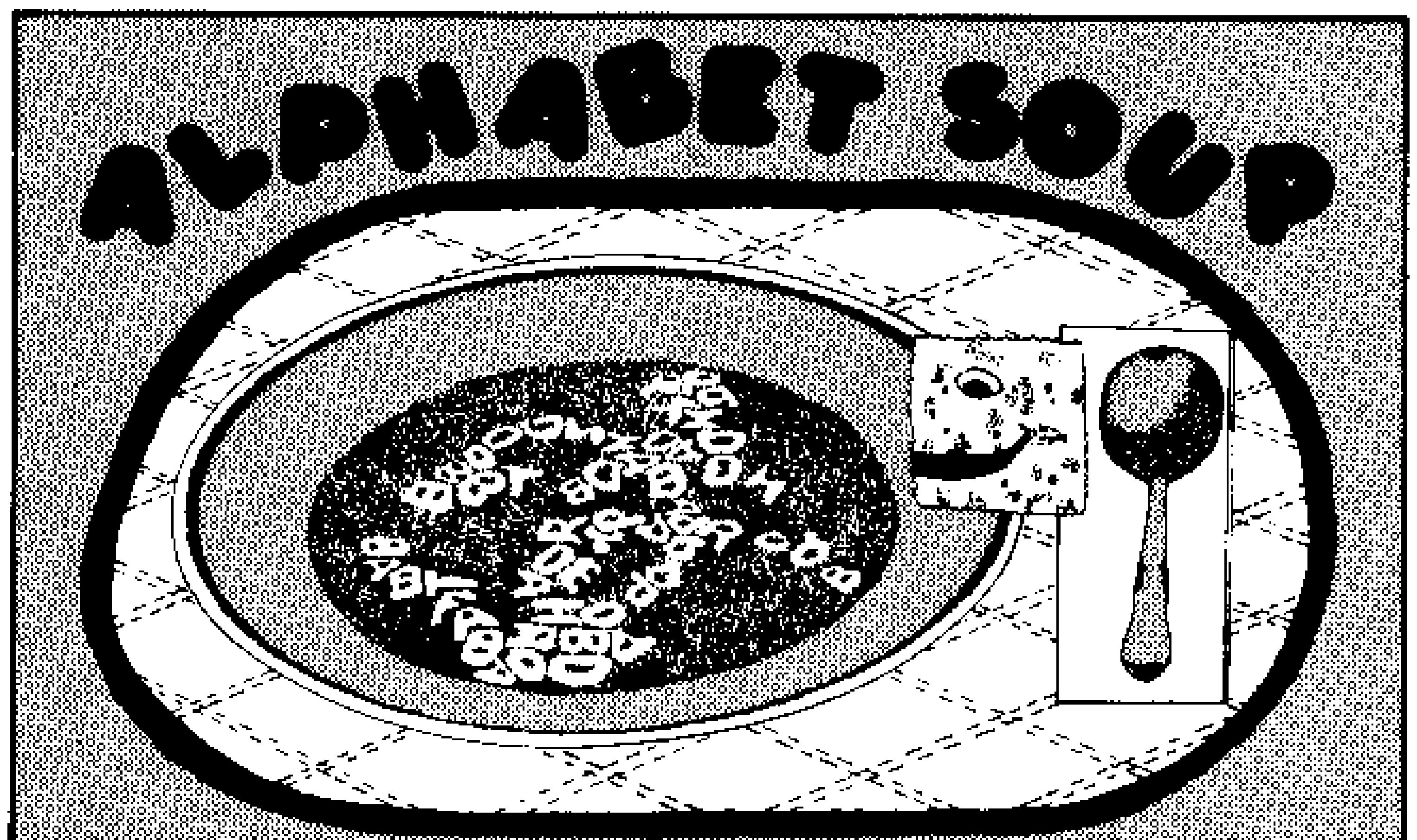

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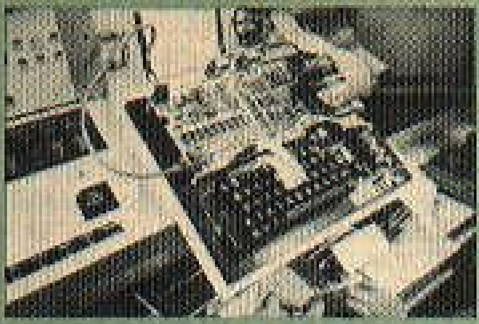
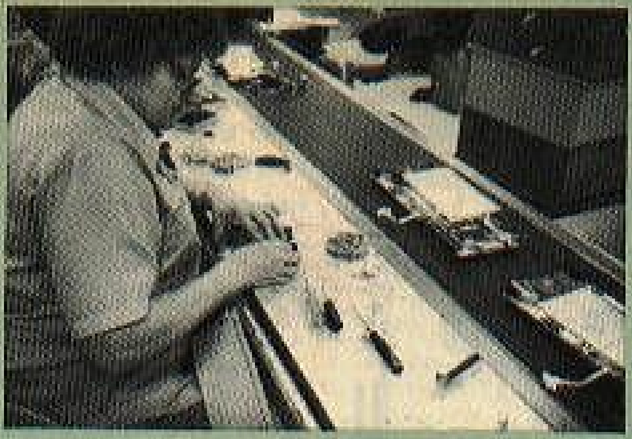
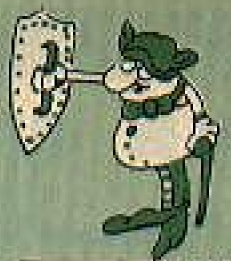
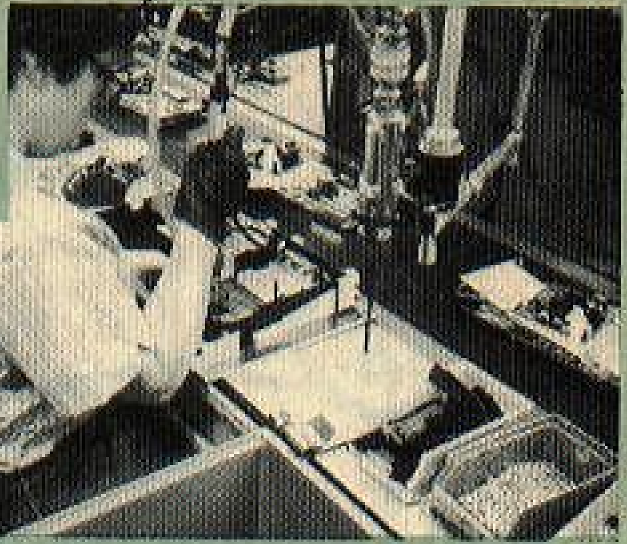


20. . . . Now, together at last, they are put to the test . . .



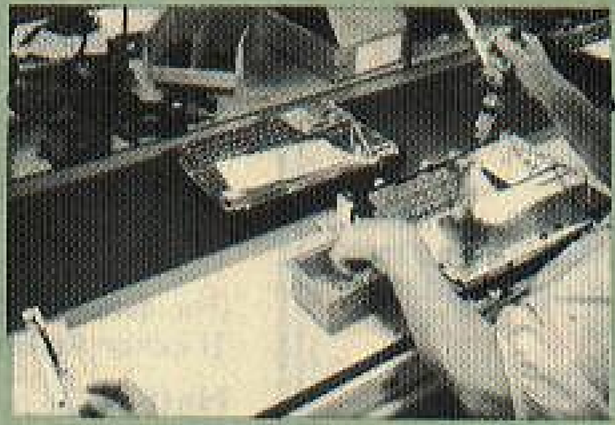
21. Boards are shielded in metal to prevent possible TV interference.





22. The power supply board goes in the case . . .

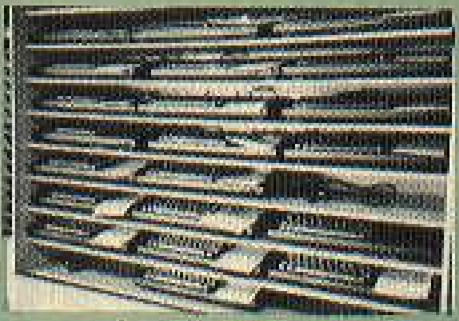
23. . . . then the main board with the computer itself.



24. Now the keyboard . . .

25. . . . and finally the bottom of the case.

26. The completed home computer gets a "drop test."



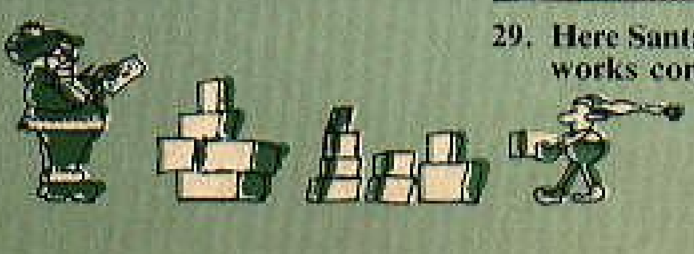
27. Then trial by fire . . . racks upon racks of Home Computer consoles stay powered up for three days straight (this is appropriately called a "burn-in" test).

28. And again each console is fully tested!

29. Here Santa's helpers make sure each key works correctly.

30. All those that meet Texas Instruments standards get "spiffy" brushed aluminum trim.

31. Each new TI Home Computer is carefully packed for that long Christmas Eve journey.



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Plotting...from p.20

for some reason, such as loading some other program into the Mini-Memory. Therefore, once it has been loaded, *do not* invoke the CALL INIT routine! Make sure that no other data is loaded into the Mini-Memory or the lower part of the memory in the Memory Expansion (HEX 2800 to HEX 3000). If the program needs to be loaded into the Mini-Memory, this can be done in one of two ways:

Method 1:

To assemble and load from the program listings—

1. Plug the Editor/Assembler cartridge into the TI-99/4A.
2. Using the Editor, enter the program segment in Listing 1 called BIT1. Save the text entered on a disk file called BIT1.
3. Create disk file BIT2 using Listing 2 as in step 2.
4. Create disk file BIT3 using Listing 3 as in step 2.
5. Create disk file BIT4 using Listing 4 as in step 2.
6. Create disk file SOURCE using Listing 5 as in step 2.
7. Execute the assembler on disk file SOURCE. Direct the object code to disk file GRAPHICS. Use Assembler option R (plus L and S options, if you have a printer).
8. Remove the Editor/Assembler cartridge and insert the Mini-Memory cartridge.
9. Put the disk containing the file GRAPHICS into disk 1.
10. Select the Mini-Memory from the main menu.
11. Select the RE-INITIALIZE option and then press PROCEED.
12. Select the LOAD AND RUN option.
13. Under file name type DSK1.GRAPHICS.
14. When the routine asks for another file name press QUIT.

The routine is now loaded into the Mini-Memory.
[For detailed information on the Editor/Assembler, consult the TI Editor/Assembler manual—Ed.]

Method 2:

To load from the 99'er Magazine-on-Tape cassette, follow the instructions below—

1. Plug Mini-Memory into the TI-99/4A.
2. Select the EASY BUG option from the main menu.
3. Press any key.
4. Press L when a question mark appears.
5. Put the cassette containing the package into the player.
6. Follow the instructions on the screen.
7. When a question mark reappears press QUIT.

The routines need the Memory Expansion for a 6K buffer in addition to the space in the Mini-Memory. If the Memory Expansion is not properly attached a blank screen will appear when the GRAPH routine is invoked.

Example BASIC Programs

The following example will scale the screen so the Xmin is −1, the Xmax is 1, the Ymin is −0.75, and the Ymax is 0.75. The axes will cover the length and height of the screen and intersect at the center. A box will be drawn around the center and the statement "This is a test!" will appear at the bottom of the screen.

```
100 REM **PLOTTING TEST ROUTINE
110 REM
120 REM 99'er Mag.
130 CALL LINK(“GCLEAR”)
140 A=.75
150 B=1
160 CALL LINK(“SCALE”,-1,B,-.75,A)
170 CALL LINK(“XAXIS”,-1,B,0)
180 CALL LINK(“YAXIS”,-.75,A,0)
190 CALL LINK(“MOVE”,.5,.375)
200 CALL LINK(“DRAW”,.5,-.375)
210 C=-.5
220 CALL LINK(“DRAW”,C,-.375)
230 CALL LINK(“DRAW”,C,.375)
240 CALL LINK(“DRAW”,.5,.375)
250 A$=“This is a test!”
280 CALL LINK(“MOVE”,-1,-.75)
290 CALL LINK(“LABEL”,A$)
300 CALL LINK(“GRAPH”)
```

The TI BASIC program following creates a box drawn in perspective on the TI-99/4A screen.

```
100 REM ** 3-D BOX **
110 REM
120 REM 99'er Magazine
130 CALL LINK("GCLEAR")
140 CALL LINK("SCALE",0,10,0,20)
150 CALL LINK("MOVE",2,8)
160 CALL LINK("DRAW",2,13)
170 CALL LINK("DRAW",7,13)
180 CALL LINK("DRAW",7,8)
190 CALL LINK("DRAW",2,8)
200 CALL LINK("MOVE",7,13)
210 CALL LINK("DRAW",8,15)
220 CALL LINK("DRAW", 3,15)
230 CALL LINK("DRAW",2,13)
240 CALL LINK("MOVE",8,15)
250 CALL LINK("DRAW",8,10)
260 CALL LINK("DRAW",7,8)
270 CALL LINK("MOVE",2.4,10.75)
280 CALL LINK("LABEL","99'er Magazine")
290 CALL LINK("GRAPH")
```

OK, that's your new tool! I wonder what you will be plotting next. . .

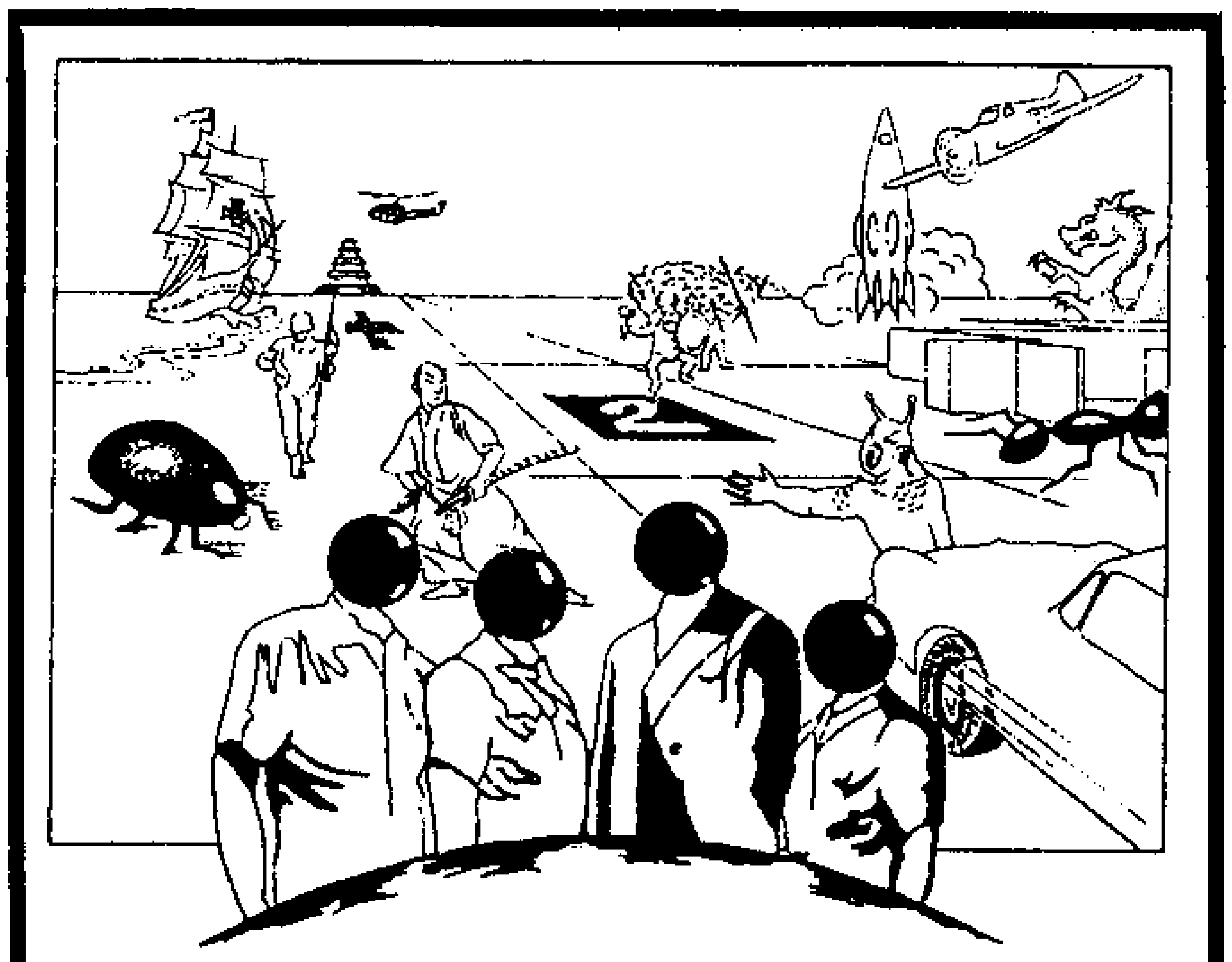
ACKNOWLEDGMENT

This package was developed with the computer facilities at the University of Dallas as a project under the guidance of Dr. Bernard Asner and Dr. Carlisle Phillips.

```
****************************
*        > BIT1 <          *
* PART ONE OF PLOTTING     *
*        ROUTINES          *
****************************
* BY JOE DEVINCENTIS, JR.
* 99'ER VERSION 2.2.1ALMM
*
        TITL 'BIT MAP LINE'
*
        DEF  DRAW
        DEF  GCLEAR
        DEF  GRAPH
        DEF  LABEL
        DEF  MOVE
        DEF  SCALE
        DEF  XAXIS
        DEF  YAXIS
*
        REF  NUMREF
        REF  STRREF

A       EQU  5
ADR     EQU  0
ARG     EQU  >835C
B       EQU  6
BASE    EQU  >8343
CFI     EQU  >12B8
CHAR    EQU  5
CHRCNT  EQU  8
CNT     EQU  9
COLOR   EQU  >1000
COUNT   EQU  9
DELTAA  EQU  7
DELTAB  EQU  8
DRFLAG  EQU  4
ERR     EQU  10
ERRBA   EQU  >1600
ERRBS   EQU  >1700
ERRCOD  EQU  >8322
ERRNO   EQU  >1400
ERROR   EQU  >00CE
ERRSNM  EQU  >1500
ERRUN   EQU  >2500
FAC     EQU  >834A
FADD    EQU  >0D80
FCOM    EQU  >0D3A
FDIV    EQU  >0FF4
FLAG2   EQU  8
FLAG4   EQU  9
FMUL    EQU  >0E88
FSUB    EQU  >0D7C
GPLWS   EQU  >83E0
KEYCOD  EQU  >8375
MASK    EQU  6
MYPGT   EQU  >2800
ORIGIN  EQU  >7118
OVF     EQU  >8354
PCT     EQU  >2000
PGT     EQU  >0000
PNT     EQU  >1800
SCAN    EQU  >000E
SNT     EQU  >1800
STATUS  EQU  >837C
VDPRD   EQU  >8800
VDPRST  EQU  >8000
VDPWA   EQU  >8C02
VDPWD   EQU  >8C00
XP1     EQU  1
XP2     EQU  3
YP1     EQU  2
YP2     EQU  4
*
        AORG ORIGIN
DELTAX  DATA 0
DELTAY  DATA 0
SAVR11  DATA 0
STASAV  DATA 0
VAL255  DATA >4102,>3700,>0000
        DATA >0000
VAL191  DATA >4101,>5B00,>0000
        DATA >0000
VDPREG  DATA >8002,>81E0,>8206
        DATA >83FF,>8403,>8506
        DATA >8717
X       DATA 0
X1      DATA 0
Y       DATA 0
Y1      DATA 0
XSAVE   DATA 0
YSAVE   DATA 0
XDOT    DATA >4001,>0000,>0000
        DATA >0000
YDOT    DATA >4001,>0000,>0000
        DATA >0000
XMAX    DATA >4102,>3700,>0000
        DATA >0000
XMIN    DATA >0000,>0000,>0000
        DATA >0000
YMAX    DATA >4101,>5B00,>0000
        DATA >0000
YMIN    DATA >0000,>0000,>0000
        DATA >0000
*
BUFFER  BYTE >FF
        BSS  >FF
        EVEN
CONREG  BSS  >20
MREGS   BSS  >20
PREGS   BSS  >20
SREGS   BSS  >20
*
*
DRAW    MOV  @STATUS,@STASAV
        MOV  R11,@SAVR11
        BLWP @DRAW1
        LWPI GPLWS
        MOV  @SAVR11,R11
        MOV  @STASAV,@STATUS
        RT
*
*
```

Continued on p. 62



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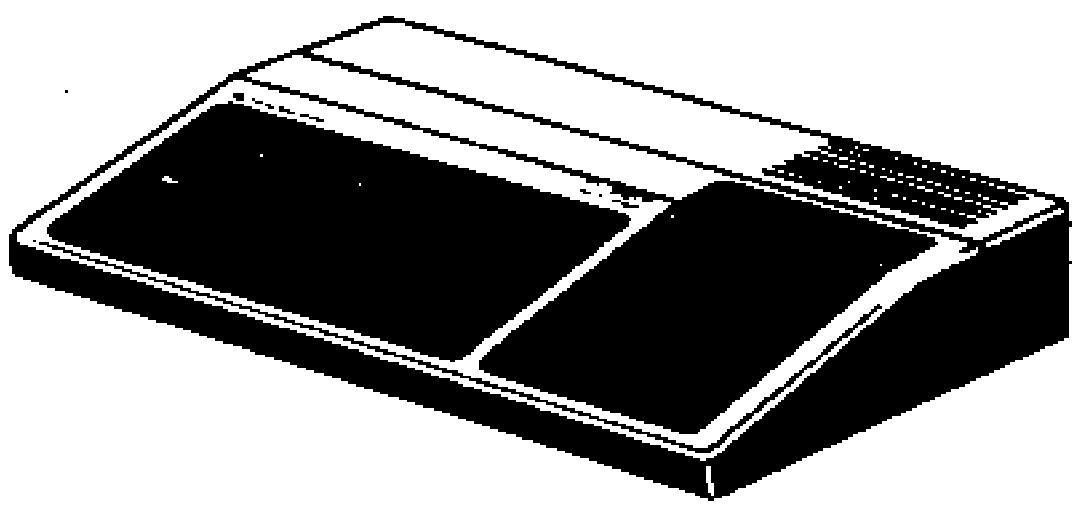

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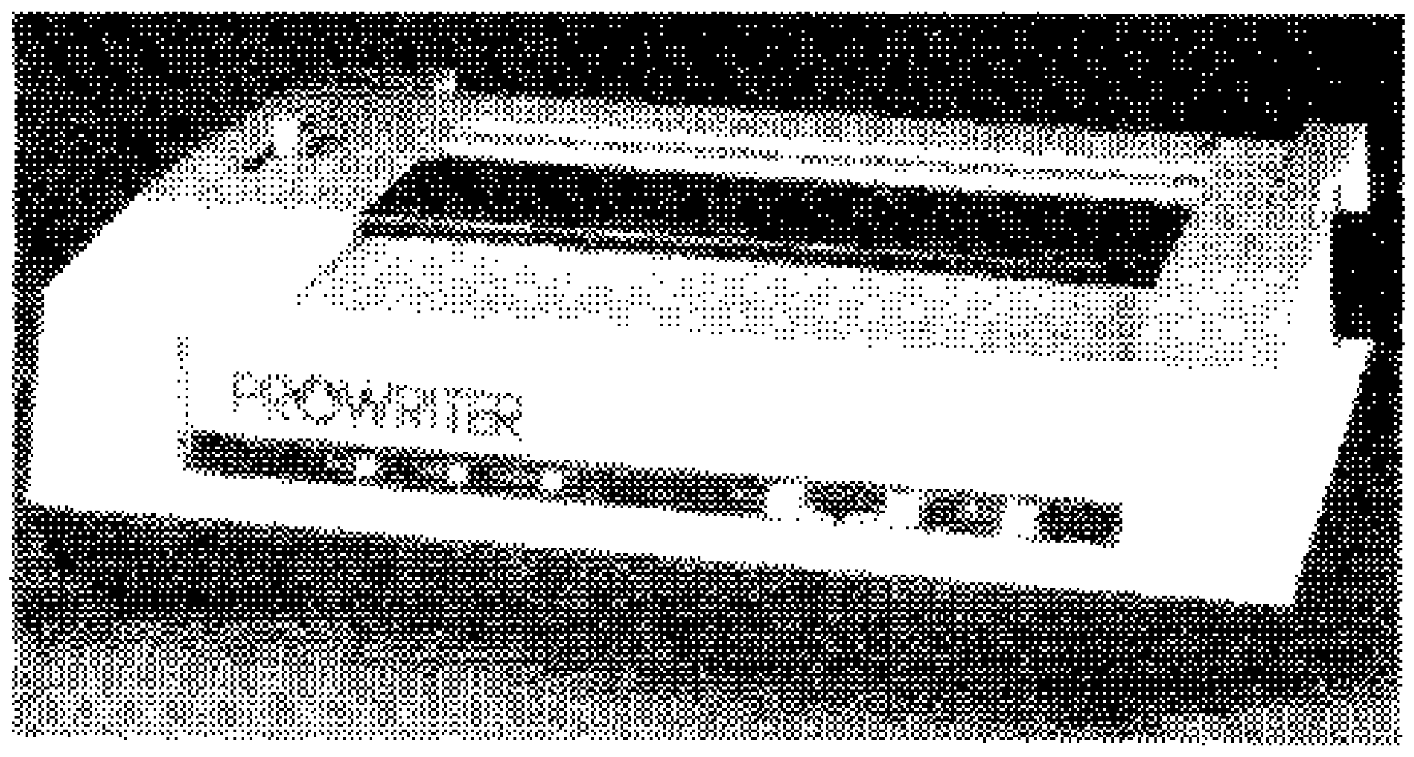
Plotting...from p.61

```
GCLEAR MOV   @STATUS,@STASAV
       MOV   R11,@SAVR11
       BLWP  @CLEAR
       LWPI  GPLWS
       MOV   @SAVR11,R11
       MOV   @STASAV,@STATUS
       RT
*
*
GRAPH  BLWP  @VDPSET
       BLWP  @GRPAH1
       LWPI  GPLWS
SCANIT BL    @SCAN
       MOVB  @STATUS,R0
       JNE   SCANIT
       LI    R0,>0020
       MOVB  @KEYCOD,R0
       CI    R0,'Q '
       JNE   SCANIT
       LI    R0,VDPRST
       BL    @VADR
       MOV   @2,R11
       B     *R11
*
*
LABEL  MOV   @STATUS,@STASAV
       MOV   R11,@SAVR11
       BLWP  @LABEL1
       LWPI  GPLWS
       MOV   @SAVR11,R11
       MOV   @STASAV,@STATUS
       RT
*
*
MOVE   MOV   @STATUS,@STASAV
       MOV   R11,@SAVR11
       BLWP  @MOVE1
       LWPI  GPLWS
       MOV   @SAVR11,R11
       MOV   @STASAV,@STATUS
       RT
*
*
SCALE  MOV   @STATUS,@STASAV
       MOV   R11,@SAVR11
       BLWP  @SCALE1
       LWPI  GPLWS
       MOV   @SAVR11,R11
       MOV   @STASAV,@STATUS
       RT
*
*
XAXIS  MOV   R11,@SAVR11
       MOV   @STATUS,@STASAV
       LI    R0,MREGS+16
       CLR   *R0+
       CLR   *R0
       BLWP  @AXIS
       LWPI  GPLWS
       MOV   @STASAV,@STATUS
       MOV   @SAVR11,R11
       RT
*
*
YAXIS  MOV   R11,@SAVR11
       MOV   @STATUS,@STASAV
       LI    R0,MREGS+16
       LI    R1,2
       MOV   R1,*R0+
       SLA   R1,1
       MOV   R1,*R0
       BLWP  @AXIS
       LWPI  GPLWS
       MOV   @STASAV,@STATUS
       MOV   @SAVR11,R11
       RT
*
*
AXIS   DATA  MREGS,AXIS1
*
AXIS1  CLR   R0
       LI    R1,2
       BLWP  @NUMREF
       LI    R2,FAC
       LI    R3,ARG
       BL    @TRDATA
       CLR   R0
       LI    R1,1
       BLWP  @NUMREF
       LWPI  GPLWS
       BL    @FCOM
       LWPI  MREGS
       MOVB  @STATUS,R0
       ANDI  R0,>4000
       JGT   AXCON1
       LI    R0,ERRBA
       B     @ERRSYS
AXCON1 MOV   @X,@XSAVE
       MOV   @Y,@YSAVE
       LI    R2,ARG
       LI    R3,SREGS
       BL    @TRDATA
       MOV   FLAG2,R1
       SRA   R1,1
       AI    R1,1
       BLWP  @CONVTR
       MOV   R0,@X(FLAG4
       LI    R2,SREGS
       LI    R3,FAC
       BL    @TRDATA
       MOV   FLAG2,R1
       SRA   R1,1
       AI    R1,1
       BLWP  @CONVTR
       MOV   R0,@X1(FLAG
       S     @X(FLAG4),R
       MOV   R0,@DELTAX(
       CLR   R0
       LI    R1,3
       BLWP  @NUMREF
       LI    R1,2
       MOV   FLAG4,FLAG4
       JEQ   AXCON2
       SRA   R1,1
AXCON2 BLWP  @CONVTR
       NEG   FLAG2
       NEG   FLAG4
       MOV   R0,@Y(FLAG4
       MOV   R0,@Y1(FLAG
       CLR   @DELTAY(FLA
       BLWP  @DRAW3
       MOV   @XSAVE,@X
       MOV   @YSAVE,@Y
       RTWP
*
*
       PAGE
```



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```
*************************
*        > BIT2 <       *
* PART TWO OF PLOTTING *
*       ROUTINES        *
*************************
* 99'ER VERSION 2.2.1ALMM
*
*LINE 0002
CLEAR  DATA MREGS,CLEAR1
CLEAR1 LI   R1,MYPGT
       LI   R2,>1800
CLCON1 CLR  *R1
       INCT R1
       DECT R2
       JNE  CLCON1
       CLR  @X
       CLR  @Y
       LI   R2,VAL255
       LI   R3,XMAX
       BL   @TRDATA
       LI   R2,VAL191
       LI   R3,YMAX
       BL   @TRDATA
       LI   R3,>4001
       MOV  R3,@XDOT
       MOV  R3,@YDOT
       CLR  @XMIN
       CLR  @YMIN
       LI   R1,3
       LI   R2,2
CLCON2 CLR  @XDOT(R2)
       CLR  @YDOT(R2)
       CLR  @XMIN(R2)
       CLR  @YMIN(R2)
       INCT R2
       DEC  R1
       JNE  CLCON2
       RTWP
*
*
CONVTR DATA CONREG,CONVT1
*
CONVT1 MOV  @2(R13),R5
       CI   R5,1
       JNE  CVCON1
       CLR  R5
       CLR  R6
       JMP  CVCON2
CVCON1 LI   R5,16
       LI   R6,8
CVCON2 LI   R2,FAC
       LI   R3,ARG
       BL   @TRDATA
       LI   R2,XMIN
       A    R5,R2
       LI   R3,FAC
       BL   @TRDATA
       LWPI GPLWS
       BL   @FSUB
       LWPI CONREG
       LI   R2,FAC
       LI   R3,ARG
       BL   @TRDATA
       LI   R2,XDOT
       A    R6,R2
       LI   R3,FAC
       BL   @TRDATA
       LWPI GPLWS
       BL   @FDIV
       BL   @CFI
       LWPI CONREG
       MOV  @FAC,*R13
       RTWP
*
*
DRAW1  DATA MREGS,DRAW2
DRAW3  DATA SREGS,DRAW4
*
DRAW2  CLR  R0
       LI   R1,1
       BLWP @NUMREF
       BLWP @CONVTR
       MOV  R0,@X1
       S    @X,R0
       MOV  R0,@DELTAX
       CLR  R0
       LI   R1,2
       BLWP @NUMREF
       BLWP @CONVTR
       MOV  R0,@Y1
       S    @Y,R0
       MOV  R0,@DELTAY
DRAW4  ABS  @DELTAX
       ABS  @DELTAY
       C    @DELTAY,@DELTAX
       JGT  DRCON1
       MOV  @DELTAX,DELTAA
       MOV  @DELTAY,DELTAB
       MOV  @X,A
       MOV  @Y,B
       CLR  DRFLAG
       JMP  DRCON2
DRCON1 MOV  @DELTAX,DELTAB
       MOV  @DELTAY,DELTAA
       MOV  @X,B
       MOV  @Y,A
       SETO DRFLAG
DRCON2 C    @X,@X1
       JLT  DRCON3
       SETO R2
       JMP  DRCON4
DRCON3 LI   R2,1
DRCON4 C    @Y,@Y1
       JLT  DRCON5
       SETO R3
       JMP  DRCON6
DRCON5 LI   R3,1
DRCON6 MOV  DELTAA,COUNT
       INC  COUNT
       MOV  DELTAB,R0
       SLA  R0,1
       MOV  DELTAA,R1
       S    R1,R0
       MOV  R0,ERR
       S    R1,R0
       MOV  DELTAB,R1
       SLA  R1,1
REDRW1 MOV  DRFLAG,DRFLAG
       JNE  REDRW2
       MOV  A,@X
       MOV  B,@Y
       JMP  REDRW3
REDRW2 MOV  A,@Y
       MOV  B,@X
REDRW3 BLWP @PLOT
       MOV  ERR,ERR
       JGT  CHNG
```

Continued on p. 66

ELIZA IS HERE!

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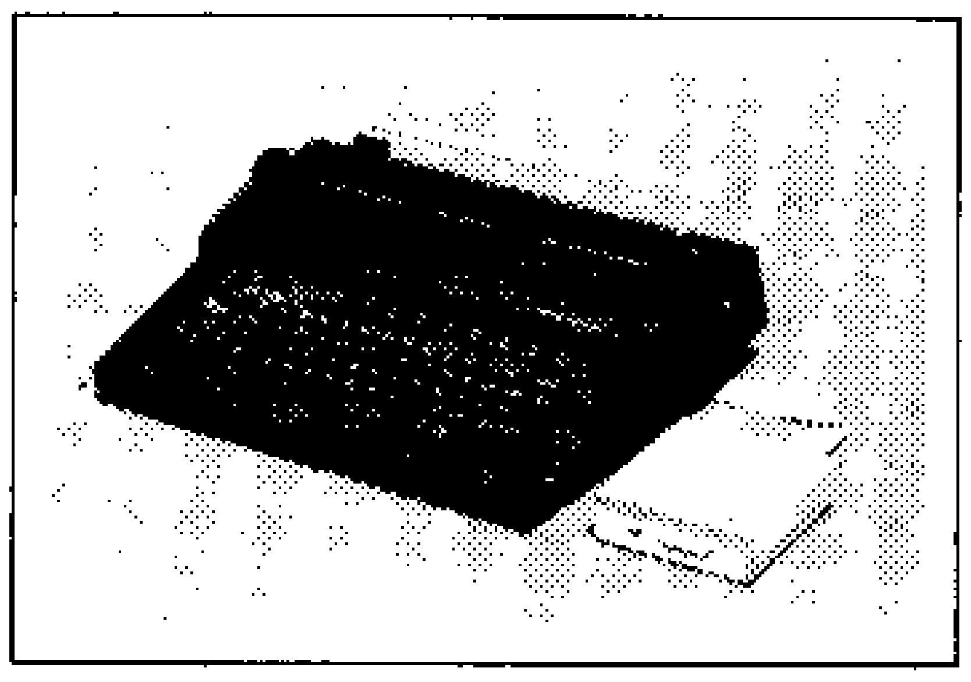

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PARSEC. . . from p.47

gaming contest. Deeply involved in the fast-paced action—with over 280,000 points and still slightly shaken from the last surprise attack by KILLER SATELLITES—the realization that I was rapidly becoming the center of attention didn't strike home until a piercing voice from the crowd cried out, "Go find the Judge!" That did it. . . I snapped out of my fantasy world of interstellar combat, quickly turned off the computer (thus erasing my score), and lickety-split lost myself on the crowded show floor. Let the *kids* win the prizes; I was supposed to be there anonymously—and be *working*!

How does all this relate to the "ultimate" video game? Let's just say that *Parsec* isn't quite there yet. Sure, it contains the requisite technical elements—a mixture of special effects and machine features that define the state of the art in personal computer gaming—but there's definitely room for improvement. Some enhancements I'd like to see in future generations of space games include 3-D perspectives; shadows of moving objects; ground-to-air interaction; auxiliary windows in the playing screen for long-range scanning and monitoring other ship functions, and the deployment of additional weapon/defense systems.

Additionally, I'd like to see the concept of distress signals and rescue attempts implemented. This might lend itself to multi-player cooperation and interaction—e.g., the entire family can work together to defeat the enemy.

I haven't even addressed the concept of speech *recognition* in a video game of this type because the low-cost implementation of this technology is still at least a year away. But just imagine—if instead of having to hit particular keys on the keyboard to vary your lift, you could verbally command your computer, "Lift 1. . . Reverse Engines. . . Lift 3. . ."

But enough of this. I've probably already told you more than you need to know. After all, we game designers must keep *some* secrets to ourselves. . . So go ahead and buy *Parsec*; you'll have a ball and might even discover some hand-eye coordination you never thought you had. As for me, it's back to the video gaming grid. Hackers like me gotta keep on working hard to stay ahead of those TI programmers. . .

Gold Rush. . . **from p.51**

```
2250 DATA 11,3,5.MINE FOREMAN,24,1,
     YOUR CHOICE?,12345
2260 DATA 24,17,"GOLD"
2270 DATA 440,660,550,660,770
2280 READ XC,YC,A$ :: DISPLAY AT(XC
     ,YC):A$ :: RETURN
2290 READ XC,YC,A$ :: DISPLAY AT(XC
     ,YC):A$ :: ACCEPT AT(XC,YC+LEN
     (A$)):AN$ :: RETURN
2300 READ XC,YC,A$,B$ :: DISPLAY AT
     (XC,YC):A$ :: ACCEPT AT(XC,YC+
     LEN(A$))VALIDATE(B$):AN$ :: RE
     TURN
2310 DISPLAY AT(22,1):A$ :: RETURN
2320 DISPLAY AT(24,1)SIZE(16):A$ ::
      RETURN
2330 CALL KEY(0,K,S):: IF S=0 THEN
     2330 ELSE RETURN
2340 SUB AR(P1,P2,Z,M)
2350 IF M<3 THEN 2370
2360 DIM M$(19):: MN$=RPT$(CHR$(1),
     28):: FOR X=1 TO 19 :: M$(X)=M
     N$ :: NEXT X :: SUBEXIT
2370 IF M=2 THEN 2390
2380 Z=ASC(SEG$(M$(P1),P2,1)):: SUB
     EXIT
2390 M$(P1)=SEG$(M$(P1),1,P2-1)&CHR
     $(Z)&SEG$(M$(P1),P2+1,29-P2)::
      SUBEND
```

MOVING?
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Follow the ridge to gain some altitude. Hey! Don't climb so steeply — you might stall and not recover in time. Phew, that was close.

OK, head out cross-country now. Try to work the thermals over rocky fields, but avoid lakes and forests — they usually have heavy downdrafts over them. Look at that eagle circling; he sure knows where the thermals are.

It's getting late; time to be heading back. The thermals are gone and there is no more ridge-lift, so you had better pick your spot to land. Push the bar forward slowly and stall it on. Slow down or you'll break your neck! . . . Watch out for the tree! . . . That's it.

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Plotting...from p.63

```
        A     R1,ERR
        JMP   INCR
CHNG    MOV   DRFLAG,DRFLAG
        JNE   REDRW4
        A     R3,B
        JMP   REDRW5
REDRW4  A     R2,B
REDRW5  A     R0,ERR
INCR    MOV   DRFLAG,DRFLAG
        JNE   REDRW6
        A     R2,A
        JMP   REDRW7
REDRW6  A     R3,A
REDRW7  DEC   COUNT
        JNE   REDRW1
        MOV   @X1,@X
        MOV   @Y1,@Y
        RTWP
*
*
ERRSYS  MOV   R0,@ERRCOD
        LWPI  GPLWS
        LI    R11,>000E
        MOV   *R11,R11
        B     @ERROR
*
*
GRPAH1  DATA  MREGS,GRPAH2
*
GRPAH2  CLR   R0
        BL    @VADW
        LI    R1,>1800
        LI    R2,MYPGT
GRCON1  MOVB  *R2+,@VDPWD
        DEC   R1
        JNE   GRCON1
        RTWP
*
*
LABEL1  DATA  MREGS,LABEL2
*
LABEL2  CLR   R0
        LI    R1,1
        LI    R2,>FF00
        MOVB  R2,@BUFFER
        LI    R2,BUFFER
        BLWP  @STRREF
        MOV   @X,XP1
        CI    XP1,256
        JLT   LBCON1
        RTWP
LBCON1  CI    XP1,>8000
        JL    LBCON2
        RTWP
LBCON2  MOV   @Y,YP1
        CI    YP1,192
        JLT   LBCON3
        RTWP
LBCON3  CI    YP1,>8000
        JL    LBCON4
        RTWP
LBCON4  CLR   CHRCNT
        MOVB  @BUFFER,CHRCNT
        SWPB  CHRCNT
        NEG   YP1
        AI    YP1,191
        SRA   XP1,3
        SRA   YP1,3
        SLA   YP1,5
        A     XP1,YP1
        MOV   YP1,ADR
        A     CHRCNT,YP1
        CI    YP1,768
        JL    LBCON5
        LI    R6,768
        S     R6,YP1
        MOV   YP1,CHRCNT
LBCON5  LI    R7,BUFFER+1
        SLA   ADR,3
        AI    ADR,MYPGT
LLOOP1  CLR   CHAR
        MOVB  *R7+,CHAR
        SWPB  CHAR
        CI    CHAR,32
        JHE   LBCON6
        CLR   CHAR
        JMP   LBCON8
LBCON6  CI    CHAR,127
        JLE   LBCON7
        LI    CHAR,127
LBCON7  AI    CHAR,-32
        SLA   CHAR,3
LBCON8  AI    CHAR,CHRTBL
        LI    CNT,8
LLOOP2  SOC   *CHAR+,*ADR+
        CI    ADR,MYPGT+>1801
        JL    LBCON9
        RTWP
LBCON9  DECT  CNT
        JNE   LLOOP2
        DEC   CHRCNT
        JNE   LLOOP1
        LI    R0,>FF00
        MOVB  R0,@BUFFER
        RTWP
*
*
MOVE1   DATA  MREGS,MOVE2
*
MOVE2   CLR   R0
        LI    R1,1
        BLWP  @NUMREF
        BLWP  @CONVTR
        MOV   R0,@X
        CLR   R0
        LI    R1,2
        BLWP  @NUMREF
        BLWP  @CONVTR
        MOV   R0,@Y
        RTWP
*
*
        PAGE
****************************
*         > BIT 3<         *
* PART THREE OF PLOTTING *
*         ROUTINES         *
****************************
* 99'ER VERSION 2.2.1ALMM
*
*LINE 0002
*
PLOT    DATA  PREGS,PLOT1
*
PLOT1   MOV   @X,XP1
        CI    XP1,256
        JLT   PLCON1
        RTWP
PLCON1  CI    XP1,>8000
        JL    PLCON2
        RTWP
PLCON2  MOV   @Y,YP1
```

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```
        CI   YP1,192
        JLT  PLCON3
        RTWP
PLCON3  CI   YP1,>8000
        JL   PLCON4
        RTWP
PLCON4  MOV  XP1,XP2
        NEG  YP1
        AI   YP1,191
        MOV  YP1,YP2
        SRA  YP1,3
        SLA  YP1,5
        SRA  XP1,3
        MOV  YP1,ADR
        A    XP1,ADR
        SLA  ADR,3
        ANDI YP2,>0007
        A    YP2,ADR
        AI   ADR,MYPGT
        MOVB *ADR,CHAR
        ANDI XP2,>0007
        MOV  ADR,R4
        MOV  XP2,R0
        LI   MASK,>8000
        SRC  MASK,0
        MOV  R4,ADR
        SOC  MASK,CHAR
        MOVB CHAR,*ADR
        RTWP
*
*
SCALE1  DATA MREGS,SCALE2
*
SCALE2  CLR  R5
        CLR  R6
        BL   @NUMGET
        LI   R5,2
        LI   R6,16
        BL   @NUMGET
        CLR  R5
        CLR  R6
        BL   @NUMSUB
        LI   R5,8
        LI   R6,16
        BL   @NUMSUB
        CLR  R5
        BL   @NUMDIV
        LI   R5,8
        BL   @NUMDIV
        RTWP
*
NUMDIV  MOV  R11,R10
        LI   R2,VAL255
        A    R5,R2
        LI   R3,FAC
        BL   @TRDATA
        LI   R2,XDOT
        A    R5,R2
        LI   R3,ARG
        BL   @TRDATA
        LWPI GPLWS
        BL   @FDIV
        LWPI MREGS
        LI   R2,FAC
        LI   R3,XDOT
        A    R5,R3
        BL   @TRDATA
        B    *R10
*
NUMGET  MOV  R11,R10
        CLR  R0
        LI   R1,2
        A    R5,R1
        LI   R2,FAC
        LI   R3,XMAX
        A    R6,R3
        BLWP @NUMREF
        BL   @TRDATA
        DEC  R1
        LI   R2,FAC
        LI   R3,XMIN
        A    R6,R3
        BLWP @NUMREF
        BL   @TRDATA
        LI   R2,XMAX
        A    R6,R2
        LI   R3,ARG
        BL   @TRDATA
        LWPI GPLWS
        BL   @FCOM
        LWPI MREGS
        MOVB @STATUS,R0
        ANDI R0,>4000
        JGT  SCCON1
        LI   R0,ERRBA
        B    @ERRSYS
SCCON1  B    *R10
*
NUMSUB  MOV  R11,R10
        LI   R2,XMIN
        A    R6,R2
        LI   R3,FAC
        BL   @TRDATA
        LI   R2,XMAX
        A    R6,R2
        LI   R3,ARG
        BL   @TRDATA
        LWPI GPLWS
        BL   @FSUB
        LWPI MREGS
        LI   R9,>0100
        CB   R9,@OVF
        JNE  SCCON2
        LI   R0,ERRNO
        B    @ERRSYS
SCCON2  CLR  R7
        CLR  R8
        MOVB @FAC,R7
        SWPB @FAC
        MOVB @FAC,R8
        ABS  R7
        ABS  R8
        MOVB R8,@FAC
        SWPB @FAC
        MOVB R7,@FAC
        LI   R2,FAC
        LI   R3,XDOT
        A    R5,R3
        BL   @TRDATA
        B    *R10
*
*
TRDATA  MOV  *R2+,*R3+
        MOV  *R2+,*R3+
        MOV  *R2+,*R3+
        MOV  *R2,*R3
        RT
*
*
VADW    ORI  R0,>4000
VADR    SWPB R0
        MOVB R0,@VDPWA
        SWPB R0
        MOVB R0,@VDPWA
        RT
*
*
VDPSET  DATA MREGS,VDP1
*
VDP1    LI   R2,VDPREG
        LI   R1,7
VDCON1  MOV  *R2+,R0
        BL   @VADR
        DEC  R1
        JNE  VDCON1
        LI   R0,SNT
        LI   R1,>D000
        BL   @VADW
        MOVB R1,@VDPWD
        LI   R0,PCT
        BL   @VADW
        LI   R1,COLOR
        LI   R2,>1800
VDCON2  MOVB R1,@VDPWD
        DEC  R2
        JNE  VDCON2
        LI   R0,PNT
        BL   @VADW
        LI   R3,3
VDCON3  CLR  R1
        LI   R2,256
VDCON4  MOVB R1,@VDPWD
        AI   R1,>0100
        DEC  R2
        JNE  VDCON4
        DEC  R3
        JNE  VDCON3
        RTWP
*
*
*
        PAGE
*************************
*       > BIT4 <        *
* PART FOUR OF PLOTTING *
*       ROUTINES        *
*************************
* 99'ER VERSION 2.2.1ALMM
*
*LINE 0002
*
CHRTBL DATA >0000,>0000,>0000,>0000 blank
       DATA >0010,>1010,>1010,>0010 !
       DATA >0028,>2828,>0000,>0000 "
       DATA >0028,>287C,>287C,>2828 #
       DATA >0038,>5450,>3814,>5438 $
       DATA >0060,>6408,>1020,>4C0C %
       DATA >0020,>5050,>2054,>4834 &
       DATA >0008,>0810,>0000,>0000 '
       DATA >0008,>1020,>2020,>1008 (
       DATA >0020,>1008,>0808,>1020 )
       DATA >0000,>2810,>7C10,>2800 *
       DATA >0000,>1010,>7C10,>1000 +
       DATA >0000,>0000,>0030,>1020 ,
       DATA >0000,>0000,>7C00,>0000 -
       DATA >0000,>0000,>0000,>3030 .
       DATA >0000,>0408,>1020,>4000 /
       DATA >0038,>4444,>4444,>4438 0
       DATA >0010,>3010,>1010,>1038 1
       DATA >0038,>4404,>0810,>207C 2
       DATA >0038,>4404,>1804,>4438 3
       DATA >0008,>1828,>487C,>0808 4
       DATA >007C,>4078,>0404,>4438 5
       DATA >0018,>2040,>7844,>4438 6
       DATA >007C,>0408,>1020,>2020 7
       DATA >0038,>4444,>3844,>4438 8
       DATA >0038,>4444,>3C04,>0830 9
       DATA >0000,>3030,>0030,>3000 :
       DATA >0000,>3030,>0030,>1020 ;
```

Continued on p. 70

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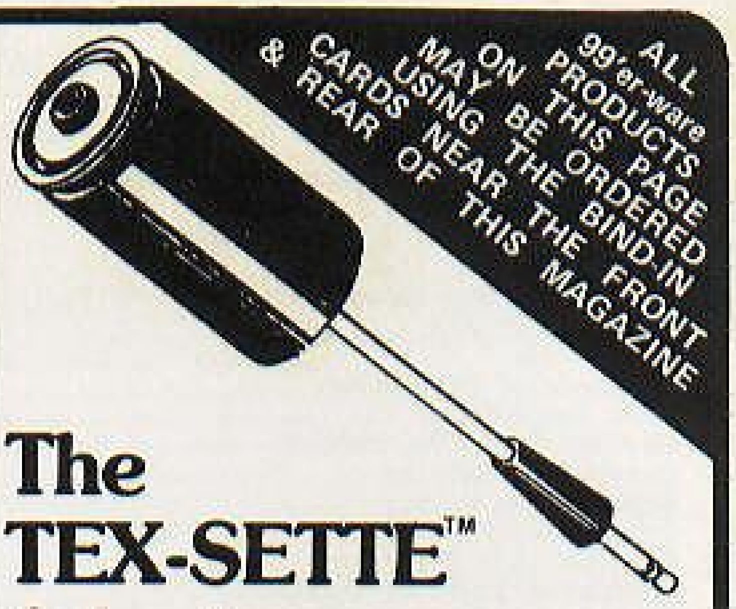

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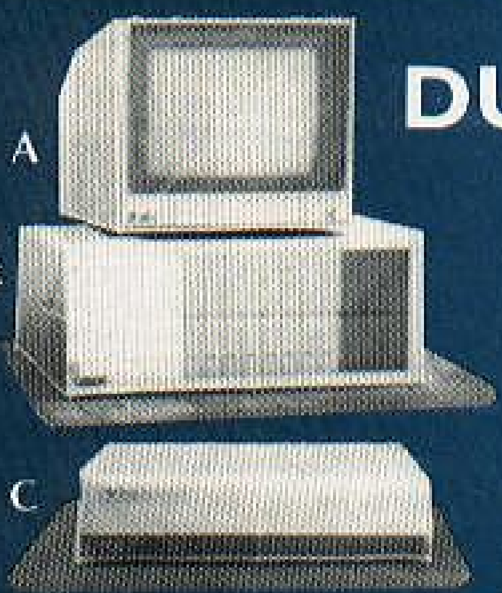

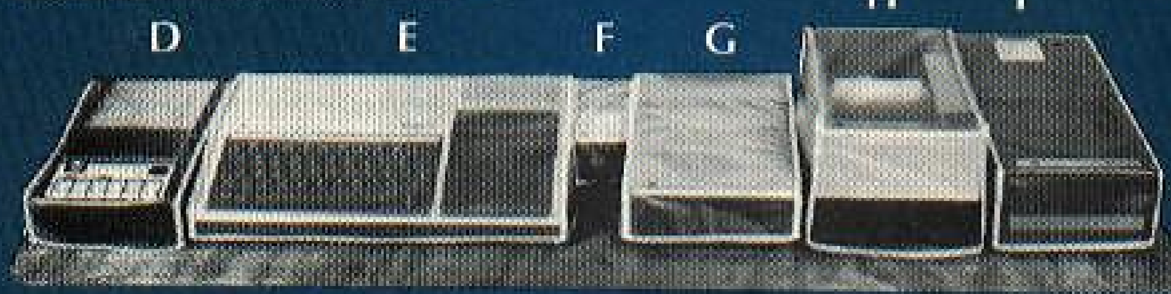

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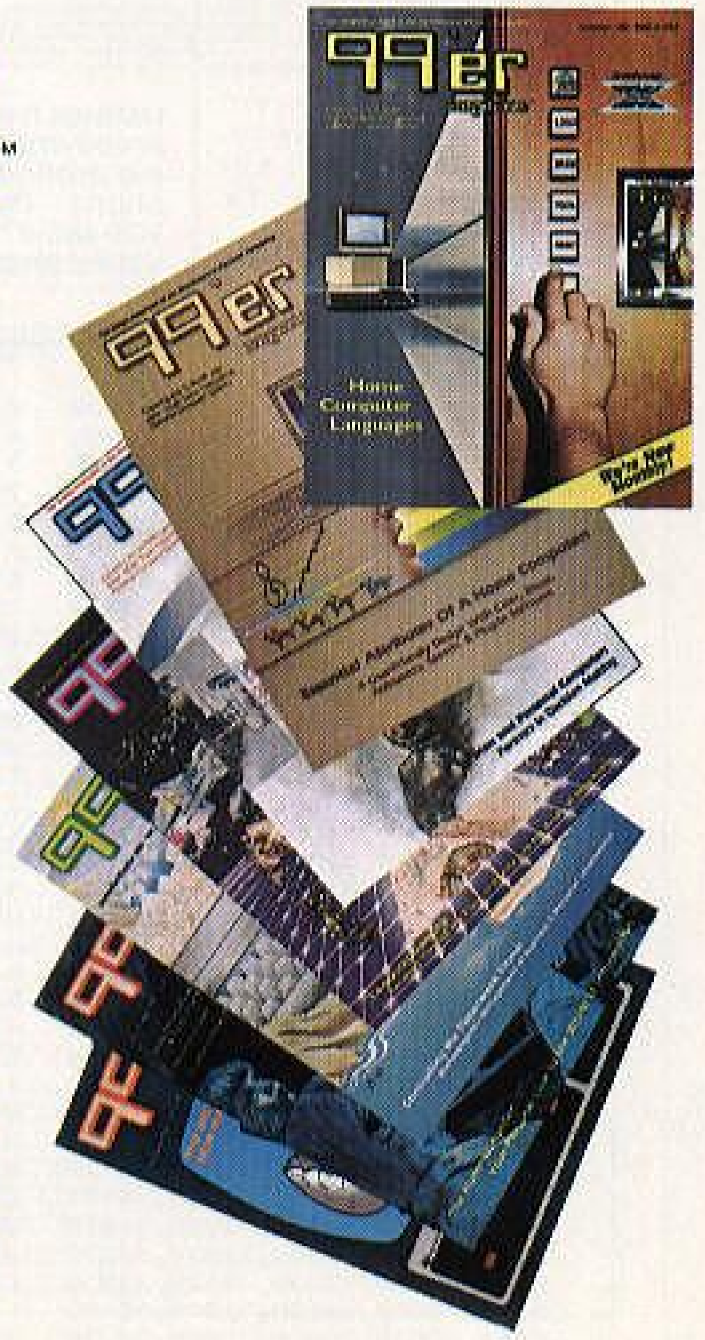

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Model	Name	Mfr. Sugg. Ret.	Elek-Tek Price
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Education/Personal Enrichment Continued			
PHD 5086	Natural Science* (Extended BASIC Command Module is required)	29 95	**24.00**
PHD 5087	Social Science* (Extended BASIC Command Module is required)	29 95	**24.00**
PHD 5088	Teacher's Tool Box* (Extended BASIC Command Module and printer are required)	29 95	**24.00**
	Cassette		
PHT 6007	Teach Yourself BASIC	29 95	**24.00**
PHT 6009	Music Skills Trainer	24 95	**20.00**
PHT 6011	Computer Music Box	14.95	**12.00**
PHT 6018	Market Simulation	14 95	**12.00**
PHT 6019	Teach Yourself Extended BASIC (Extended BASIC Command Module is required)	19.95	**16.00**
PHT 6026	Bridge Bidding I	24 95	**20.00**
PHT 6031	Speak & Math™ Program (Solid State Speech™ Synthesizer and Terminal Emulator II are required)	24 95	**20.00**
PHT 6039	Bridge Bidding II	24 95	**20.00**
PHT 6041	Bridge Bidding III	24.95	**20.00**
PHT 6042	Spell Writer (Terminal Emulator II Command Module and Solid State Speech™ Synthesizer are required)	24 95	**20.00**
PHT 6067	Beginner's BASIC Tutor	24.95	**20.00**
Entertainment			
	Command Modules		
Texas Instruments Packages			
PHM 3009	Football	29 95	**24.00**
PHM 3018	Video Games I	29 95	**24.00**
PHM 3023	Hunt the Wumpus	24 95	**20.00**
PHM 3024	Indoor Soccer	29 95	**24.00**
PHM 3025	Mind Challengers	24 95	**20.00**
PHM 3030	A-Maze-Ing	24 95	**20.00**
PHM 3052	Tombstone City 21st Century	39 95	**32.00**
PHM 3053	TI Invaders	39 95	**32.00**
PHM 3054	Car Wars	39 95	**32.00**
PHM 3057	Munch Man	39 95	**32.00**
PHM 3042D	Tunnels of Doom (2 Diskette Games Included)	59 95	**45.00**
PHM 3042T	Tunnels of Doom (2 Cassette Games Included)	59 95	**45.00**
PHM 3056	Alpiner*	39 95	**32.00**
PHM 3110	Chisholm Trail	39 95	**32.00**
PHM 3112	Parsec*	39 95	**32.00**
Milton Bradley Packages (Developed by Milton Bradley Company)			
PHM 3031	The Attack††	39 95	**32.00**
PHM 3032	Blasto††	24 95	**20.00**
PHM 3033	Blackjack and Poker††	24 95	**20.00**
PHM 3034	Hustle††	24 95	**20.00**
PHM 3036	ZeroZap††	19 95	**16.00**
PHM 3037	Hangman††	19 95	**16.00**
PHM 3038	Connect Four††	19 95	**16.00**
PHM 3039	Yahtzee††	24 95	**20.00**
Adventure International Packages (Developed by Scott Adams)			
PHM 3041D	Adventure (Pirate Adventure Diskette Game Included)	49 95	**40.00**
PHM 3041T	Adventure (Pirate Adventure Cassette Game Included)	49 95	**40.00**
Gabriel Industries Packages (Developed by Gabriel Industries)			
PHM 3067	Othello† (Developed by Gabriel Industries)	39 95	**32.00**
	Diskette		
Texas Instruments Packages			
PHD 5002	TI-Trek (with optional speech)	14 95	**12.00**
PHD 5010	Mystery Melody	14 95	**12.00**
PHD 5015	Oldies But Goodies—Games I	19 95	**16.00**
PHD 5017	Oldies But Goodies—Games II	24 95	**20.00**
PHD 5025	Saturday Night Bingo (Solid State Speech™ Synthesizer is required)	29 95	**24.00**
PHD 5037	Draw Poker (Extended BASIC Command Modules is required)	24 95	**20.00**
PHD 5057	Tombstone City 21st Century (32K Memory Expansion and Extended BASIC Command Module are required)	19 95	**16.00**
PHD 5058	TI Invaders (32K Memory Expansion and Either Extended BASIC or Editor/Assembler Command Module are required)	19 95	**16.00**
PHD 5060	Munch Man (32K Memory Expansion and Either Extended BASIC or Editor/Assembler Command Module are required)	19 95	**16.00**
Adventure International Adventure Series (Developed by Scott Adams) (PHM 3041D required)			
PHM 5046	Adventureland	29 95	**24.00**
PHD 5047	Mission Impossible	29.95	**24.00**
PHD 5048	VooDoo Castle	29.95	**24.00**
PHD 5049	The Count	29 95	**24.00**
PHD 5050	Strange Odyssey	29 95	**24.00**
PHD 5051	Mystery Fun House	29 95	**24.00**
PHD 5052	Pyramid of Doom	29 95	**24.00**
PHD 5053	Ghost Town	29 95	**24.00**
PHD 5054	Savage Island I & II	39 95	**32.00**
PHD 5056	Golden Voyage	29 95	**24.00**
	Cassette		
Texas Instruments Packages			
PHT 6010	Mystery Melody	9 95	**9.00**
PHT 6015	Oldies But Goodies—Games I	14 95	**12.00**
PHT 6017	Oldies But Goodies—Games II	19 95	**16.00**
PHT 6025	Saturday Night Bingo (Solid State Speech™ Synthesizer is required)	24 95	**20.00**
PHT 6037	Draw Poker	19 95	**16.00**
Adventure International Adventure Series (Developed by Scott Adams) (PHM 3041T required)			
PHT 6046	Adventureland	29 95	**24.00**
PHT 6047	Mission Impossible	29 95	**24.00**
PHT 6048	Voodoo Castle	29 95	**24.00**
PHT 6049	The Count	29 95	**24.00**
PHT 6050	Strange Odyssey	29 95	**24.00**
PHT 6051	Mystery Fun House	29 95	**24.00**
PHT 6052	Pyramid of Doom	29 95	**24.00**
PHT 6053	Ghost Town	29 95	**24.00**
PHT 6054	Savage Island I & II	39 95	**32.00**
PHT 6056	Golden Voyage	29 95	**24.00**
OTHER APPLICATION PROGRAMS			
	Command Modules		
PHM 3001	Demonstration	69 95	**58.00**
PHM 3011	Speech Editor (Solid State Speech™ Synthesizer is required)	44 95	**36.00**
PHM 3014	Statistics (Data storage system is recommended)	44 95	**36.00**
PHM 3026	Extended BASIC	99 95	**75.00**
PHM 3035	Terminal Emulator II	49 95	**40.00**
PHM 3055	Editor/Assembler	99 95	**80.00**
PHM 3058	Mini-Memory (4K)	99 95	**80.00**
PHM 3045D	SMU Electrical Engineering Library (2 Diskettes included)	149 95	**120.00**
PHM 3045T	SMU Electrical Engineering Library (10 Cassettes included)	149 95	**120.00**
	Diskette		
PHD 5004	Programming Aids I	14 95	**12.00**
PHD 5005	Programming Aids II	24 95	**20.00**
PHD 5006	Math Routine Library	29 95	**24.00**
PHD 5008	Electrical Engineering Library	29 95	**24.00**
PHD 5012	Programming Aids III	19 95	**16.00**
PHD 5013	Graphing Package	19 95	**16.00**
PHD 5016	Structural Engineering Library	29 95	**24.00**
PHD 5044	AC Circuit Analysis	29 95	**24.00**
PHD 5063	UCSD-PASCAL Compiler (32K Memory Expansion and P Code required)	124 95	**100.00**
PHD 5064	UCSD p-System Assembler/Linker (32K Memory Expansion and P-code required)	99 95	**80.00**
PHD 5065	UCSD p-System Editor/Filer/Utilities (32K Memory Expansion and P-code required)	74 95	**60.00**
PHD 5066	TI PILOT (32K Memory Expansion and P-code required)	79 95	**60.00**
PHD 5068	Course Designer Authoring Package (Extended BASIC required and Video Controller optional)	199 95	**150.00**
PHD 5075	Text-To-Speech (English) a (Solid State Speech™ Synthesizer, 32K Memory Expansion and Extended BASIC Command Module are required)	29 95	**24.00**
	Cassette		
PHT 6004	Programming Aids I	9 95	**9.00**
PHT 6006	Math Routine Library	24 95	**20.00**
PHT 6008	Electrical Engineering Library	24 95	**20.00**
PHT 6013	Graphing Package	14 95	**12.00**
PHT 6016	Structural Engineering Library	24 95	**20.00**
PHT 6044	AC Circuit Analysis	24 95	**20.00**
SOFTWARE LIBRARIES			
PHL 7001	The Home Financial Manager	139 95	**100.00**
PHL 7002	The Family Entertainer	89 95	**65.00**
PHL 7003	The Elementary Educator	99 95	**75.00**
PHL 7004	The Music Educator	64 90	**50.00**
PHL 7005	The Super Programmer	119 00	**90.00**
PHL 7006	The Speaking Math Teacher	119 85	**90.00**
PHL 7007	The Speaking Reading Teacher	109 90	**85.00**
PHL 7008	The Speaking Scholastic Spelling Teacher	219 80	**160.00**
PHL 7009	The TI Arcade Game Series	119 85	**90.00**
PHL 7010	The Milton Bradley Game Series	114 75	**90 00**
PHL 7011	The Computer Introductory Package	119 85	**90.00**

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